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A MONOGRAPHIC STUDY OF THE HEMIPTEROUS FAMILY NABIDAE AS IT OCCURS IN NORTH AMERICA

BY

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INTRODUCTION.

This paper, a summary of studies carried on by the writer during the past few years, is offered as a contribution to our knowledge of the insects of the hemipterous family Nabidae. Even tho few in number of species, the family is world-wide in distribution. The American forms of the group have been described largely in the works of Stål and Reuter and unfortunately the type specimens, deposited in museums of other countries, have been unavailable to American workers. The original descriptions of the species have been printed largely in some language other than the English and have also to a great extent not been available to the average worker. These difficulties coupled with the fact that many of the species are dimorphic or even polymorphic in regard to wing development have made it extremely hard for the systematists of this country to correctly place specimens in their collections. It is the author's hope that this paper will alleviate these troubles and be of some aid to students of the Hemiptera.

The work has been made possible only thru the hearty cooperation of the systematists and the curators of museums of this country. Especially does the writer owe thanks to the following who have by the loan of specimens, by giving valuable suggestions, or otherwise helped in this study:

Dr. Carl J. Drake, at whose suggestion and under whose guidance the work was undertaken, Dr. H. H. Knight, Dr. H. B. Hungerford, Dr. T. B. Frison, Dr. H. M. Parshley, Mr. W. L. McAtee, Mr. H. G. Barber, Mr. Wm. J. Gerhard, Mr. E. P. Van Duzee, Mr. W. E. China, Mr. J. R. de la Torre-Bueno, Mr. W. S. Blatchley, Prof. J. M. Watson and Prof. R. W. Harned.

In this paper synoptic keys, with descriptions and those biological notes that are available, are given for all the species of the family known to occur in North America including Central America and the West Indies. The descriptions have been made, wherever possible, from specimens before the author. They were drawn up under a binocular microscope with 7.5 x ocular and 40 mm. objective using a micrometer eyepiece upon which 24 divisions equal one millimeter. In comparing measurements of the anterior femora, as is done especially in the genus Nabis, the length is the distance along the lower surface from the apex of trochanter to tibia and the thickness or depth is the greatest distance from dorsal (outer) to ventral (inner) surface when the femur is studied from the side. The width of the insect is always taken at the pronotum, except where expressly stated otherwise, and the length of the pronotum is always the median measurement. The synonymy and bibliography of each species are reduced to include only the citations of most importance.

HISTORY AND PHYLOGENY OF THE NABIDAE.

The family Nabidae was constructed by Costa in 1852 as a division, the subfamily Nabini, of the family Reduviidae. In 1861 Fieber elevated the group to family rank, separating it from its nearer relatives by the 4-segmented beak. This opinion of the independent family rank of the group was followed by Stål, by Reuter, and by most of the recent authors, tho some retained it as a subfamily of the Reduviidae. The writer considers the family to be distinct from the Reduviidae from which its members may be differentiated by the very evidently 4-segmented beak, the absence of a striated or granulated groove on the prosternum for the reception of the tip of the beak, by the different nature of the branching of the veins of the hemelytra, the differently constructed genitalia, and the difference in the eggs and in oviposition habits.

The name Nabidae has recently been changed to Nabididae and was so used by Bergroth and others. Perhaps this resulted from Distant's use (1904) of the term as Nabidinae. The writer has been unable to find that anyone has given reasons for the change and he feels that the name should remain as it was originally used. The name is based upon the genus Nabis as used first by Latreille in 1802. In the Latin literature the world Nabis occurs both as a common noun and as a personal noun. As a common noun it was used as the name of a giraffe, derived from Nabun, the genitive of which is Nabis; thus by

adding idae to the stem the name would be Nabidae. However, if Latreille had the personal noun Nabis (the name of a king of Sparta; genitive, Nabidis) in mind the family name should be Nabididae.

Phylogenetically the Nabidae are considered as relatively primitive insects. They are closely related to the Reduviidae, the Enicocephalidae, and the Phymatidae and with these constitute the superfamily Reduvioideae. Perhaps as Reuter has suggested these latter forms have descended from the nabids or from nabid-like ancestors. Certainly the nabid subfamily Pachynominae approaches the Reduviidae remarkably closely, so much so in fact that the writer after having seen a specimen of Pachynomus biguttatus (Stål) from Bombay can scarcely free himself from the belief that it more nearly represents a true Reduviid than a Nabid. Its rostrum, altho 4-segmented, is not more distinctly so than in the Reduviid. Aphelonotus simplus Uhler which formerly was considered as a Nabid. Likewise the pronotum, the antennae, and the legs are formed as in Aphelonotus and the author feels that future study may prove these genera to be closely related ones. On the other hand a comparison of the Nabid genus Pagasa Stål with the Anthocorid genus Piezostethus Duf. discloses so great a similarity that one wonders if they have not a closer relationship than is indicated by their present position in different superfamilies.

THE ECONOMIC IMPORTANCE OF THE NABIDAE.

The Nabids are so far as known without exception of a predacious nature. Altho the family is small in size (approximately 200 species are known) it ranges thruout the world and the members often occur in rather large numbers. They are small to medium in size and are commonly found in and around vegetation where they wander about in search of prey. Their food consists largely of aphids, leaf-hoppers, plant-bugs, and small caterpillars but when pressed by hunger they will not hesitate to attack forms much larger than themselves. Many instances have been recorded in the literature of nabids feeding upon such important crop pests as the Chinch Bug (Blissus leucopterus Say), the Hessian Fly (Mayetiola destructor Say), the Corn Ear Worm (Chloridea obsoleta Fabr.), and others. Osborn (1912) considers the group to be of great importance as enemies of the common leaf-hoppers affecting grasses. The writer has observed members of the family feeding upon many different species of aphids, leaf-hoppers, plant-bugs, caterpillars, and on one occasion he found a specimen of N. roseipennis Reuter with its beak inserted in the body of a female canker-worm moth from which it was extracting the body juices. However, due to the rather non-specialized feeding habits the group can perhaps never be considered of especial importance in the control of any one species. Their value arises in their role as checks against the grass and shrub infesting insects in general. The fact that the Nabids

insert their eggs in the stems of plants has led some to believe that they may at times offset their beneficial qualities by thus injuring the plants. It is doubtful however that there is ever sufficient oviposition to seriously injure a plant. Perhaps an equally unimportant factor is that some species will frequently inflict painful bites when they are improperly handled.

BIOLOGY OF THE NABIDAE IN GENERAL.

Habitat.

The Nabids are to be found in varied situations depending upon the species. All are terrestrial. Some are ground-dwellers and are to be found running about on the ground or hidden beneath objects on the ground. The majority of our species however, are plant inhabiting forms and they slowly wander about over low foliage in search of prey. Some prefer higher plants and are to be had only by beating trees. Many species inhabit only shady situations where the vegetation is rank, others prefer moist places where the sedges and reeds abound, while still others are lovers of the sun and are to be found in the open fields and meadows. The members of one genus (Arachnocoris) so far as known are inhabitants of webs of spiders where they live suspended from the under-side of the webs and apparently prey upon other insects that may be caught there. The nymphs of a few species are myrmecophilous and are to be found running about in company with certain ants to which they bear a remarkably close resemblance.

Life Habits.

The adults and nymphs spend the greater part of their time in feeding or in seeking food. Some are active in the search, others prefer to lie in wait or to slowly stalk their prey. Almost invariably a struggling captive is fiercely grasped between the apposed surfaces of the fore femora and tibiae while the beak is inserted in some point upon its body, usually the base of the head. In most cases a captive ceases to struggle in a moment after the suctorial stylets of the Nabid have pierced its body, - perhaps due to the injection of some toxic substance. Occasionally a Nabid particularly if recently fed will show fright and run from prospective prey. The nymphs of some of the species have the protective habit, when disturbed during their wandering over the herbage, of folding their legs and dropping to the ground.

In mating as observed in the genus Nabis the male mounts the female from the rear, grasping her with the fore and hind legs and almost invariably prodding her about the head with his beak. Usually a fierce struggle ensues, the female using her beak in an effort to dislodge the unwelcome suitor. The male bends the abdomen downward around either side so that one clasper may be hooked within the valves of the female genital segments. The clasper apparently serves two functions - for holding the genital segments of the two in apposition i.e., as a clasping structure, and as

a means of directing the oedagus. Copulation lasts often for an half hour and apparently occurs as often as the male is successful in his attacks upon the female. As a prelude to the mating the males of several species of the genus Nabis (and perhaps all of them) spend a considerable portion of their time in what is apparently a form of stridulation. A specimen climbs to some point of vantage upon the foliage and resting there proceeds to bend the abdomen slightly to one side and then rapidly beat it with the hind tibia of that side. The process halts at short intervals and then is continued. The writer has observed this occurrence in the males of N. sordidus, N. annulatus, N. ferus, N. subcoleoptratus, and N. roseipennis and altho there is no sound perceptible to his ear he feels confident that the process must constitute a form of stridulation for the attraction of the sexes. This is evidenced by the fact that males kept in captivity away from females will often spend hours at the process only stopping at short intervals. When such an individual becomes aware of the presence of a female introduced into his cage he slowly advances toward her, stops at times to make a few strokes with the tibia on the genital segment, then when sufficiently close suddenly makes a rush to catch her. The active part of the stridulatory apparatus seems without question to be the rather stiff setae on the inside of the hind tibiae. The passive part remains yet to be discovered. Altho the writer has observed stridulating individuals under a lens he has yet to decide if the tibial spines are rasped

against the clasper, the sides of the genital segment, or even perhaps against the very definite row or comb of setae that surmounts the apex of the last genital segment.

The eggs are placed within the stems of plants. They are cylindrical and slightly curved in outline and possess a reticulate cap that seems to be characteristic in shape for each species. The cap is the only visible portion when an egg is in place. It fits in and over the end of the egg in much the same way as a cork in a vial and when the egg hatches is simply pushed outward where it hangs suspended by a slender thread. The length of the different life-stages varies with the species. Five moults occur in all species whose life history is completely known. All species have heretofore been thought to pass the winter in the adult stage, the author however has proved that one at least, N. subcoleoptratus (Kirby), lives thru the winter in the vicinity of Ames in the egg stage.

Polymorphism.

Many species of Nabids exhibit pterygomorphism. In some there is a true long-winged form and a true short-winged form, while in others only the long-winged form is known to occur. At least one species has many different forms in regard to wing development, there being apparently all gradations between a true brachypterism and true macropterism. In some of our more common species the long-winged form is extremely rare and when it does occur it apparently is associated with the female sex. What the de-

termining factors in wing development are remains yet to be discovered. The fact that in some species examples from more southern localities have better developed wings than those from more northern localities indicates that temperature may play an important part in wing development.

Accompanying the development or non-development of wings there is in all species a corresponding variation in the development of the thorax and thus in the body form. In many species there are even strong variations in such other important taxonomic characters as size of eyes and ocelli, lengths of antennal segments, degree of incrassateness of the fore femora and shape of scutellum. Then there is in many species, especially in Nabis, often much variation in color development. This likewise apparently is dependent largely on temperature. For example in N. annulatus and N. sordidus specimens collected by the author at Ames, Iowa in a low, moist, cool situation have invariably possessed darker markings than have specimens from Florida and other southern localities. In the latter individuals the darker markings are replaced by much lighter ones or often by crimson ones. The writer presumes that the crimson markings are present in the Iowa specimens but that they are overshadowed by the darker pigment, which supposedly is a melanin located in the cuticula while the lighter markings are hypodermal in origin.

Family NABIDAE (Costa).

1852. Nabini Costa, Cimic. Neap., Cent. III, p. 66.

1858. Nabides Stål, Öf. Vet. Akad. Förh., XV, p. 247.

1861. Nabidae Fieber, Europ. Hemip., pp. 25, 43.

1865. Nabida Stål, Hemip. Afr., III, p. 37.

1872. Nabidae Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 68.

1873. Nabidae Stål, Enum. Hemip., III, p. 106.

1908. Nabidae Reuter, Mém. Soc. Ent. Belg., XV, p. 87.

1909. Nabidae Reuter and Poppius, Acta Soc. Sci. Fenn., XXXVII, No. 2, p. 3.

Small to medium in size; antennae slender, much longer than head, 4-segmented (often with a more or less ring-like supplementary segment between I and II) or distinctly 5-segmented. Eyes large. Ocelli usually present, if absent the head is not dilated toward the apex. Rostrum free, 4-segmented, the basal segment short, usually about as broad as long. Pronotum divided transversely into two lobes exclusive of the apical collar. Prosternum without a median longitudinal stridulatory groove. Hemelytra coriaceous, when fully developed with clavus, corium, membrane, and sometimes embolium; the membrane with two or three longitudinal cells which rarely are unclosed. Anterior legs raptorial. Tarsi usually triarticulate (uniarticulate in Carthasis), the claws apical; aroliae absent. Posterior coxae rotatorial. Male genital segment symmetrical.

The family was divided by Stål into three subfamilies, only two of which are known to occur in the Americas.

Key to Subfamilies.

Pronotum with the apical collar absent or extremely narrow; rostrum stout; legs short and thick; clavus not or scarcely widened posteriorly; antennae often 5-segmented. . . . .
PROSTEMMINAE, p. 14.

Pronotum with the apical collar wide and distinct; rostrum more slender; legs longer and more slender; clavus widened posteriorly; antennae always only 4-segmented. . . . .
NABINAE, p. 43.

Subfamily PROSTEMMINAE (Reuter).

1873. Nabina Stål, Enum. Hemip., III, pp. 106, 107.

1890. Prostemmina Reuter, Revue d'Ent., IX, p. 289.

1904. Prostemmaria Distant, Fauna Br. Ind., Rhyn., II, p. 391.

1909. Nabina Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, No. 2, pp. 3, 7.

Body oblong to sub-elongate, convex from beneath. Head immersed to (or almost to) the eyes. Ocelli distinct. Eyes prominent. Antennae 4-segmented with a ring-like supplementary segment at the base of II, or distinctly 5-segmented. Rostrum of medium length, moderately stout, the third segment extending beyond the base of the head. Pronotum sub-transverse, more or less constricted or impressed at or behind the middle; the apical collar very narrow or entirely lacking; the sides not or at most only obsoletely margined; the base feebly emarginate. Scutellum moderately large. Hemelytra with embolium distinct; the clavus not or only scarcely widened posteriorly. Metapleuron with the ostiolar orifice

well developed. Anterior acetabula strongly approaching the front margin of the prothorax. All coxae moderately elongate. Anterior legs with trochanters unarmed beneath, femora incrassate and tibiae provided with a distinct spongy lobe at the apex.

This subfamily is represented thruout the faunal regions of the world. The large genus Prostemma Leon Duf. is Palaearctic and Ethiopian in distribution. Of the remaining six genera only three are represented in our region.

Key to American Genera of Prostemminae.

I. Body shiny; antennae 5-segmented or with supplementary segment between I and II distinct; pronotum distinctly constricted at the sides into two lobes; basal segment of venter unkeeled . . . . . II.

Body opaque; antennae 4-segmented with the supplementary segment absent or obsolete; pronotum only feebly constricted at the sides; basal segment of venter with a median longitudinal keel . . Phorticus p. 16.

II. Antennae with the supplementary segment much less than one-half as long as I; anterior and intermediate femora angularly widened to about the middle and armed there with a stout tooth; the part beyond the tooth greatly enlarged, that before the tooth not greatly enlarged, spinulose beneath . . . . . Alloeorrhynchus, p. 21.

Antennae with the supplementary segment about one-half as long as I, thus distinctly 5-segmented; anterior femora elongate-fusiform in shape, armed beneath with piceous teeth . . . . . Pagasa, p. 34.

Genus PHORTICUS Stål.

1860. Phorticus Stål, Rio Jan. Hemip., I, p. 69.

1873. Phorticus Stål, Enum. Hemip., III, pp. 107, 109.

1890. Phorticus Reuter, Revue d'Ent., IX, p. 290.

1893. Phorticus Reuter, Wien. Ent. Zeit., XII, p. 317.

1904. Phorticus Distant, Fauna Br. Ind., Rhyn., II, p. 395.

1909. Phorticus Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, No. 2, pp. 8, 49.

Small, oblong to oblong-ovate; smooth, opaque, pilose. Head short, somewhat conically produced before the eyes. Ocelli distinct, far apart. Antennae short, placed on the side of the head before the middle of the anteocular part, segments I and II thickened, III and IV slender, all more or less thickly clothed with long hairs; the supplementary segment very small or absent. Rostrum moderately long; segment II extending beyond base of head, subequal to III and IV conjoined. Pronotum more or less distinctly transversely impressed behind the middle, without a distinctly marked off apical collar, sometimes with a faint median longitudinal impressed line on the disc; the basal margin truncate. Scutellum equilateral, the disc bifoveate near the base. Membrane, when developed, with two to four oblong cells. Legs short; anterior femora more or less incrassate, usually armed beneath; anterior tibiae widened distally with a spongy fossa at apex. Ostiolar canal distinct. Venter laterally compressed at the base, thus with a distinct, short, median carina there;

the last segment produced posteriorly on either side above so that it incloses the disc-like genital segment of the female. Type of genus, Phorticus viduus Stål.

Phorticus is a widely distributed genus. It reaches its highest development, apparently, in the Ethiopian and Australian realms. Of the three species heretofore known from the Americas two were described from Brazil and the other from Texas. A fourth from Panama is described below. All the specimens of this genus that I have seen have a distinct median, longitudinal carina on the meso- and metasternum. The prothorax is produced much farther forward dorsally than ventrally so that when seen from the side its front margin is strongly obliquely slanted backwards.

Key to Species of Phorticus.

Anterior femora strongly incrassate, angularly widened beneath near the middle, and armed there with a strong tooth and denticulate from there to apex; apical margin of corium straight . . . . . .collaris Stål, p. 17

Anterior femora only slightly thickened, not distinctly angularly widened beneath, the under surface minutely denticulate along distal two-thirds; apical margin of corium distinctly sinuate . . . . . .speciosus n. sp., p. 19.

Phorticus collaris Stål.

1873. Phorticus collaris Stål, Enum. Hemip., III, p. 109.

1899. Phorticus collaris Champion, Biol. Centr. Amer., Heter., II, p. 301, Pl. XVIII, fig. 21.

1909. Phorticus collaris Reuter et Poppius, Acta Soc. Sc. Fenn., XXXVII, No. 2, pp. 50, 54.

Small, oblong, thickly clothed with moderately long hairs; brownish, variegated with ochraceous. Head slightly shiny, brown, paler toward apex; longer than broad, tumid beneath. Eyes large, rather coarsely granulate. Ocelli wide apart, prominent. Antennae testaceous, segment I thick, slightly surpassing apex of head; II enlarged distally, subequal to width of head through eyes; III thinner and slightly shorter than II; I thinly and II and III thickly clothed with long hairs; the proportion of segments I:II:III = 6:14:12. Rostrum pale testaceous, extending onto mesosternum, segment II reaching to margin of pronotum, slightly longer than width of head thru eyes (16:14); III twice as long as IV and conjoined with it slightly longer than II.

Pronotum with a large triangular spot extending from apex to middle of anterior lobe, and a smaller somewhat obsolete median spot on disc of posterior lobe ochraceous; slightly broader than long (34:29), transversely impressed behind the middle, the transverse impression bearing a row of distinct punctures; the anterior lobe with a faint median longitudinal line which ends in a fovea in front of transverse impression; basal margin almost truncate. Scutellum with sides sinuate, the basal half rather level, coarsely punctate, the apical half raised, impunctate, bearing many long hairs, the disc with a large pit on each side of median line. Hemelytra with basal halves of clavus and corium and

a large spot on disc of corium ochraceous, apex of corium fuscous; veins of clavus and corium bordered with lines of punctures; membrane smoky, the veins distinct. Under surface and legs testaceous. Anterior femora strongly incrassate, armed as in key; anterior tibia strongly widened apically, serrately denticulate within, with a distinct spongy fossa at the apex. Intermediate and posterior legs short and stout, pilose, the tibiae also with a few spine-like setae on the outer surface and at the apex. Meso- and metasternum with a distinct median ridge. Venter laterally compressed at the base, the basal margins of the segments coarsely pitted. Length, 3.28 mm.; width, 1.03 mm.

Collaris was described from Brownsville, Texas. Champion has since recorded it from Mexico. The above description is made from a winged female bearing the label, Brownsville, Texas, June. Nothing is known of the habits except that it occurs on the ground.

Phorticus speciosus n. sp.

Smaller than collaris, the color paler, tending to a chestnut brown; the ochraceous patch on anterior lobe of pronotum larger, extending back indistinctly to transverse impression; posterior lobe without ochraceous markings; hemelytra ochraceous to about middle of clavus, then gradually blending into brownish.

Head testaceous brown, shiny, slightly broader than long, globose beneath, clothed with long hairs. Eyes prominent, granulate. Ocelli large. Segment I of antennae surpassing apex of head, slightly shorter than in collaris, (other segments missing). Rostrum as in collaris, but slightly paler and slenderer. Pronotum broader than long (30:34), slightly constricted behind the middle, the transverse impression with indistinct punctures, the basal margin slightly angularly emarginate. Scutellum as in collaris, the punctures on base smaller and more scattered, the apex more acutely produced. Hemelytra smooth, the rows of punctures bordering the veins of clavus and corium indistinct; the basal margin of the membrane distinctly sinuate; membrane paler, the veins finer and more indistinct than in collaris. Anterior femora only moderately incrassate, armed before the middle with a bicuspidate tooth and minutely denticulate from there to apex. Anterior tibia widened apically, denticulate within, with a spongy fossa at the apex. Venter laterally compressed at the base, the median carina there distinct; basal margins of segments punctate. Length, 2.85 mm.; width, .92 mm.

Described from a macropterous female, holotype, taken at Ancon, C. Z., Panama, May 12, 1911, A. H. Jennings. Type deposited in U. S. National Museum. This pretty little species may be separated from our only other representative of the genus, collaris Stål, by its smaller size, paler color, with different markings, less hairy body, shorter legs,

and less incrassate anterior femora. The sinuate base of the membrane gives to it an appearance which reminds one, only in a much less degree, of the hemelytra in the genus Apheloneotus Uhler. The head has two faint impressions between the ocelli, which also are present in collaris. The type specimen was taken at an arc light.

Genus ALLOEORRHYNCHUS Fieber.

1861. Alloeorhynchus Fieber, Europ. Hemip., pp. 43, 159.

1865. Alloeorhynchus Stål, Hemip. Afr., III, p. 40.

1873. Alloeorhynchus Stål, Enum. Hemip., III, pp. 107, 109.

1904. Alloeorhynchus Distant, Fauna Br. Ind., Rhyn. , II, p. 393.

1909. Alloeorrhynchus Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, No. 2, p. 33.

Oblong-ovate, smooth, shiny, moderately thickly clothed with long hairs. Head rather short, somewhat conically produced before the eyes, immersed in the pronotum to or almost to the eyes. Eyes large, their posterior margin sinuate. Ocelli prominent. Antennae slender, segment II slightly thickened distally, III and IV slender, all clothed with short hairs; the supplementary segment minute, much shorter than segment I. Rostrum moderately thick, extending on to mesosternum, segment II longest; III and IV conjoined about equal to II.

Pronotum about as long as broad, constricted behind the middle; without a wide, well marked off collar; the basal margin rather truncate. Scutellum dull, bifoveate

on the disc. Hemelytra, when developed, reaching to apex of abdomen; the clavus and corium with rows of distinct punctures along the veins; membrane with two or three oblong discal cells. Legs moderately long, the anterior and intermediate femora dentately ampliated before the middle and armed from there to apex with minute teeth. Anterior tibiae angularly widened at the apex and provided there with a spongy fossa. Mesosternum and mesopleuron shiny. Metapleuron dull, rugulose, with a distinct orifice. (Type, Alloeorrhynchus flavipes Fieb.)

This genus, world wide in distribution, is represented in the Neotropical realm by six known species, two of which are described below as new to science. In all the species known to the writer there is, as in our species of Phorticus, a distinct median longitudinal carina on the mesosternum, this carina extending back onto the metasternum. Also there is on each side of the first segment of the venter, just behind and lateral to the posterior coxae a greatly enlarged posteriorly directed spiracle. The general shape of the canal of the metapleuron is characteristic for our species. The Oriental species marginalis Distant and corallinus Stål are said to be without the angular ampliation of anterior and intermediate femora (subgenus Psilistus Stål.)

Key to Species of Alloeorrhynchus.

I. Pronotum entirely nigro-piceous . . . . . II.

Pronotum with the anterior lobe wholly or partly testaceous or rufo-testaceous . . . . . .III.

II. Hemelytra nigro-piceous unicolorous thruout; length 5 mm. . . . . vittativentris Stål, p.24.

Hemelytra yellowish at base; length 3.5 mm. . . . . armatus Uhler, p.25.

III. Posterior lobe of pronotum rufo-testaceous, with three large piceous spots, one on each humeral angle and one occupying middle of disc; hemelytra in greater part dull . . . .trimacula (Stein), p. 26.

Posterior lobe of pronotum not distinctly trimaculate with black; hemelytra shiny thruout . . . .IV.

IV. Hemelytra in greater part piceous brown, the costal margins pale; length 4.5 mm. or more . . . . . V.

Hemelytra in greater part pale yellow; length 3.5 mm. or less . . . . . VI.

V. Pronotum piceous brown, only the lateral margins paler; femora testaceous thruout; width of an eye equal to width of vertex. . flavomarginatus n.sp., p. 28.

Pronotum yellowish testaceous with a basal band piceous; intermediate and posterior femora annulate with piceous before the apex; width of an eye less than width of vertex . . . . . nigrofasciatus n. sp., p. 29.

VI. Width of an eye equal to one-half that of vertex; segments I-V of connexivum each with a fine submarginal row of recumbent, piceous spinules, the rows together forming an interrupted line along connexivum above and beneath . . delicatus n. sp., p.31.

Width of an eye distinctly less than one-half that of vertex; sides of venter without black line of spinules. . . . . .nigrolobus Barber, p. 32.

Alloeorrhynchus vittativentris Stål.

1873. Alloeorhynchus vittativentris Stål, Enum. Hemip., III, p. 109.

1900. Alloeorrhynchus vittativentris Champion, Biol. Centr. Am., Rhyn.,II, p. 200, Tab. XVIII, fig. 19.

1909. Alloeorrhynchus vittatriventris Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, p. 44.

"Nigro-piceous, nitidus, metapleuris subopacis, cum mesopleuris fortiter sculpturatis; capite, pronoto scutelloque pilis paucis longis erectis, hemielytris sat dense et sat breviter pilosis, pilis nonnihil retrorsum vergentibus; scutello subnitido, hemielytra totis nitidis, unicoloribus; antennis fusco-testaceis, basin versus pallescentibus; rostro, pedibus, ventre maculisque marginalibus superioribus abdominis pallide sordide flavescentibus, rostro basin versus, tibiis apice vel apicem versus infuscatis, vitta laterali ventris utrinque margineque postico segmentorum ventralium inter vittam et marginem nigricantibus; femoribus anticis pronoto paullo longioribus; modice incrassatis, inferne ante medium in dentem obtusum ampliatis, pone hunc crebre subtiliter denticulatis, femoribus intermediis inferne paullo pone medium denticulo armatis, ab eo apicem versus minute denticulatus; tibiis anticis margine inferiore fuscocrenulatis, apicem versus oblique ampliatis et inferne fossa spongiosa instructis, hac circiter tertiam apicalem partem tibiae occupante; rostro articulo secundo duobus ultimus simul sumtis aeque longo; pronoto lobo antico capite cum oculis paullo latiore, lateribus subparallelis, lobo postico antico fere dimido latiore, hemielytris abdomini aeque latis. Long. 5, lat. 1-1/2 mm."

This species was originally described from Bogota, Colombia. Champion records it from Volcan de Chiriqui, Panama and states that it is closely related to A. armatus Uhler. The above description is that of Reuter and Poppius (1909). These authors say in regard to Champion's figure "forte: color corii figurae eodem typi dilutior". The specimen reported by the author from Guatemala (Proc. U. S. Natl. Mus., 69, Art. 21, p. 1, 1926) is A. armatus Uhler.

Alloeorrhynchus armatus Uhler.

1894. Alloeorhynchus armatus Uhler, Proc. Zool. Soc. Lond. for 1894, p. 204.

1909. Alloeorrhynchus armatus Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, p. 41.

Elongate oblong, smooth, shiny, thinly clothed with scattered, long, fine hairs; rufo-piceous to reddish brown, the antennae, rostrum, legs, venter, and basal part of hemelytra to beyond apex of scutellum flavo-testaceous to testaceous. Head concolorous with pronotum, short, as broad as long. Eyes moderately large. Ocelli distinct. Antennae clothed with short fine hairs, segment I subequal in length to width of vertex with one eye; proportion of segments, I:II:III:IV = 12:21:20:26. Rostrum extending to middle of mesosternum, segment II scarcely one-half longer than antennal I; III and IV together about equally as long as II.

Pronotum smooth, broader than long (40:34); the anterior lobe twice as long as posterior lobe (median measure); the basal margin feebly emarginate. Scutellum dull,

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Pronotum smooth, broader than long (40:34); the anterior lobe twice as long as posterior lobe (median measure); the basal margin feebly emarginate. Scutellum dull,

bifoveate on the disc, clothed above with numerous very long, fine, erect or semi-erect hairs. Hemelytra shiny, the inner third of clavus dull for its entire length; inner third and apex of clavus and apical third of corium and embolium and all of cuneus rufo-piceous; clavus and corium with the usual rows of deep punctures along the veins; membrane smoky. Legs pale testaceous, the posterior tibiae darkened; anterior femora with the dentate ampliation before the middle; intermediate femora only slightly incrassate, with the ampliation three-fifths from the base. Mesopleuron shiny, rugulose, concolorous with pronotum. Metapleuron opaque. Meso- and metasternum with a longitudinal keel. Venter shiny, slightly embrowned. Length, 3.59 mm.; width, 1.19 mm.

Armatus has been known only from the type locality, Grenada, West Indies. The above description is made from a winged female, collected by Barber and Schwarz, Alta V. Paz., Guatemala. It differs from Uhler's description in that the head is rufo-piceous thruout, the second antennal segment is not fully twice as long as first, the apical joints are not fuscous, the pronotum is rufo-piceous rather than deep-black, and the venter is not "margined on submargin with a piceous curved line".

Alloeorrhynchus trimacula (Stein).

1860. Prostemma trimacula Stein, Berl. Ent. Zeit., IV, p. 76.

1873. Alloeorhynchus trimacula Stål, Enum. Hemip., III, p. 109.

1900. Alloeorrhynchus trimacula Champion, Biol. Centr. Am., Rhyn., II, p. 300, Tab. XVIII, f. 20.

1909. Alloeorrhynchus trimacula Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, p. 40.

Elongate-oblong, rather thickly clothed with moderately long semi-erect hairs. Head rufo-piceous, shiny, broader than long and distinctly broader than collar of pronotum, width of vertex slightly greater than width of an eye. Eyes prominent. Ocelli distinct. Antennae long, dark testaceous to piceous, paler distally; segment I longer than width of vertex with one eye; proportion of segments: I:II:III:IV = 20:37:35:40. Rostrum piceous brown, reaching upon mesosternum, segment II slightly longer than I of antennae; III about three-fourths as long as II.

Pronotum broader than long (female, 60:50), shiny; rufo-testaceous, the collar above, a large spot on each humeral angle (extending down on pleura) and another occupying the middle of the disc of the posterior lobe, piceous black; posterior lobe two-thirds as long as anterior lobe, the basal margin slightly reflexed and feebly sinuate. Scutellum dull brown, clothed with long semi-erect hairs, bifoveate on disc and sulcate posteriorly, the apex distinctly bifid. Hemelytra in greater part dull, concolorous with scutellum; the costal margin for its entire length shiny, flavo-testaceous to testaceous; membrane dull, smoky. Legs flavo-testaceous, the anterior trochanters, the apical one-third to one-half of all femora, and the tibiae and tarsi rufo-piceous to testaceous; anterior femora with the dentate

ampliation placed before the middle. Mesopleuron shiny, rugulose, concolorous with the maculae on the humeral angles of pronotum. Venter flavo-testaceous, with a broad submarginal stripe on each side (converging posteriorly) rufo-piceous. Connexivum above broadly exposed, segments two to five each with a piceous patch of short, fine, recumbent spinules. Male clasper as in figure (Plate III, fig. 10). Length (male, female), 5.4 - 6.3 mm.; width, 1.5 - 1.8 mm.

This species is recorded in the literature from Mexico, Guatemala, Panama, and Brazil. The above description is taken from a male from Bugaba, Panama and a female from Cahabon, Vera Paz, Guatemala, both collected by Champion and listed by him in Biologia Centrali Americana. In each of these specimens there is more of a rufous tinge to the dark color than is shown in Champion's figure.

Alloeorrhynchus flavomarginatus n. sp.

Elongate oblong, smooth, shiny, moderately thickly clothed with long semi-erect hairs; rufo-piceous, the lateral margins of pronotum (extending onto pleura), costal margins of hemelytra to middle of cuneus, rostrum, legs, and venter flavo-testaceous. Head rufo-piceous, the apex pale; broader than long and distinctly broader than apex of pronotum. Eyes very prominent, each subequal in width to vertex. Ocelli distinct. Antennal segment I longer than width of vertex with one eye; II four-fifths longer than I (36:20); (III and IV missing). Rostrum extending onto mesosternum,

segment II subequal to I of antennae, III three-fourths as long as I. Pronotum broader than long (52:40), the length of anterior lobe equal to width of head thru eyes, posterior lobe three-fifths as long as anterior lobe, basal margin slightly reflexed and feebly emarginate. Scutellum about as in trimacula. Hemelytra shiny; rufo-piceous, the entire costal margin to apex of cuneus paler, tending to flavo-testaceous proximally; clavus and corium with the usual rows of distinct punctures along the veins. Anterior femora with the dentate ampliation placed before the middle. Mesopleura rufo-piceous, shiny. Metapleura brown, dull, rugulose; the canal prominent. Venter somewhat embrowned, with a broad submarginal stripe on each side (converging posteriorly) rufo-piceous to brown; clothed with numerous scattered long hairs. Connexivum without black patches of spinules. Length, 5.07 mm.; width, 1.57 mm.

Holotype: winged female, Essequebo R., Br. Guiana, A. Busck, collector, July 1921. Type deposited in U. S. Natl. Museum. This species is perhaps most closely related to vittativentris Stål and trimacula Stein but may be readily distinguished from either by its different coloration.

Alloeorrhynchus nigrofasciatus n. sp.

Elongate, oblong, smooth, shiny, moderately thickly clothed with rather long, semi-erect hairs. Head piceous black, broader than long and distinctly broader than apex of

pronotum. Eyes moderately prominent, the width of each less than width of vertex. Ocelli distinct. Antennae testaceous; length of segment I scarcely equal to width of vertex with one eye; II about twice as long as I (28:14), III and IV missing. Rostrum flavo-testaceous, the basal segment embrowned, segment II about a third longer than antennal I; III and IV conjoined slightly longer than II.

Pronotum flavo-testaceous, the narrow collar embrowned, a fascia on basal margin (considerably widened on disc) piceous; broader than long (46:40), the anterior lobe scarcely twice as long as posterior; the basal margin slightly rounded. Scutellum brown, dull, bifoveate on the disc, with a median impression before the apex; the apex slightly expanded and distinctly bifid. Hemelytra shiny thruout; rufo-piceous, the embolium, basal half of the corium, and outer basal half of clavus flavo-testaceous; membrane fuscous. Legs flavo-testaceous, the intermediate and posterior femora annulate with reddish brown before their apices; anterior and intermediate femora ampliately dentate before the middle. Mesopleuron piceous black, shiny, rugulose; metapleuron dull. Meso- and metasternum longitudinally carinate down the middle. Venter flavo-testaceous, with a macula on each side at the base and the genital segments embrowned. Connexivum above broadly exposed, segments II-V each with a small patch of recumbent, piceous spinules. Length, 4.4 mm.; width, 1.38 mm.

Holotype, winged female, Alta V. Paz., Guatemala. Type deposited in U. S. National Museum. This pretty little species is at once recognizable from our other members of the genus by the piceous basal fascia of the pronotum. The eyes are distinctly smaller than in flavomarginatus n. sp. and the legs much shorter than in that species.

Alloeorrhynchus delicatus n. sp.

Small, elongate-oblong, shiny, clothed with a few fine hairs; flavo-testaceous, the head, posterior lobe of pronotum, scutellum, cuneus, mesopleuron and mesosternum reddish brown. Head short, broader than long and distinctly broader than apex of pronotum. Eyes fairly large, each about one-half as wide as vertex. Ocelli prominent. Segment I of antennae flavo-testaceous, subequal in length to width of vertex with an eye (11:12); (remaining segments missing). Rostrum reaching onto mesosternum, segment II one-third longer than antennal I, III five-sixths as long as II. Pronotum broader than long (39:33), the posterior lobe (median measurement) one-half as long as anterior lobe. Scutellum opaque, clothed with numerous, long, semi-erect hairs, bifoveate on the disc; the apex slightly expanded, bifid. Hemelytra shiny thruout, minutely punctate, the clavus and corium with the usual rows of distinct punctures along the veins; membrane transparent. Legs pale thruout, the anterior and intermediate femora widened and armed before the middle with a stout tooth, minutely denticulate

from there to apex; anterior and intermediate tibiae serrately dentate within, the former widened on apical third and provided with the usual spongy fossa at the apex. Meso- and metasternum longitudinally carinate down the middle. Connexivum above and beneath with an interrupted, submarginal, piceous line of fine recumbent spinules. Length, 3.94 mm.; width, 1.09 mm.

Holotype, male, Ancon, C. Z., Panama, May 12, 1911, A. H. Jennings, Allotype, female, and paratypes, one male and two females, taken with type. Type deposited in U. S. National Museum. This delicate little species is closely related to the following (nigrolobus Barber), from which it may be readily separated by its larger eyes, the presence of the line of recumbent spinules on the connexivum, and the darker apical part of corium. The scutellum is not so strongly contracted apically as in nigrolobus. The margin of the propleuron is deeply notched just behind the acetabula and the notch provided with a distinct tooth-like projection.

Alloeorrhynchus nigrolobus Barber.

1922. Alloeorrhynchus nigrolobus Barber, Proc. Ent. Soc. Wash., XXIV, p. 103.

Size, form and color markings about as in A. delicatus n. sp., the paler markings tending to a testaceous, the cuneus only feebly infuscate. Head as long as broad, its width thru the eyes slightly greater than width of apex of pronotum. Eyes rather small, not prominent, the width of one less than one-half of width of vertex. Ocelli distinct.

Antennae flavo-testaceous, the apical segments somewhat embrowned; moderately thickly clothed with short hairs, segment I subequal in length to width of vertex with one eye; proportion of segments, I:II:III:IV = 12:25:22:20. Rostrum extending onto mesosternum, segment II subequal to segment I of antennae; III and IV together equal to II. Pronotum with the anterior lobe slightly darker and broader than in delicatus, its sides less strongly rounded. Scutellum paler and more constricted apically than in delicatus. Hemelytra lighter, more pilose, the corium and embolium more distinctly punctulate, corium only slightly darkened apically. Venter darker at apex, the connexivum without the submarginal row of black spinules. Length, 3.67 mm.; width, 1.06 mm.

Nigrolobus was described from Brownsville and San Antonio, Texas and has heretofore been known only from there. The above description is taken from a specimen from Bowie, Arizona, collected July 15, 1917, by Dr. H. H. Knight, and kindly compared with the types of nigrolobus in the National Museum by Dr. C. J. Drake. Specimens are also at hand from Bonita, Arizona, July 16, 1917 and Lordsburg, N. Mex., July 13, 1927, H. H. Knight, collector. In addition to the differences pointed out above the shape of the ostiolar canal and of the male clasper will readily separate this species from its ally A. delicatus n. sp.

Genus PAGASA Stål.

1862. Pagasa Stål, Rio Jan. Hemip., II, p. 60.

1865. Pagasa Stål, Hemip. Afr., III, p. 38.

1873. Pagasa Stål, Enum. Hemip., III, pp. 107, 108.

1899. Pagasa Champion, Biol. Centr. Amer., Heter., II, p. 297.

1909. Pagasa Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, No. 2, p. 25.

Oblong to subelongate, narrowed anteriorly, shiny, the head, pronotum, and scutellum thinly clothed with long, semi-erect hairs, hemelytra pilose. Head conically produced in front of the eyes. Eyes large, almost or touching apex of pronotum. Ocelli distinct, the distance between them greater than their distance from the eyes. Antennae inserted on side at about middle of anteocular part of head, rather short, segments I, II, and III somewhat thickened, IV and V slenderer and clothed with longer hairs; the supplementary (II) segment about one-half as long as I; I short, only slightly surpassing apex of head. Rostrum rather short, stout. Pronotum constricted distinctly behind the middle; anterior lobe narrowed toward apex, apical collar narrow, indistinct; posterior lobe broad, its basal margin slightly sinuate. Scutellum moderately large, sub-equilateral, bifoveate on the disc. Hemelytra when developed with cuneus well marked off; membrane in macropterous form with three oblong cells from which many veins radiate to the margin. Legs rather short, thickly pilose, the anterior femora strong-

ly incrassate, armed beneath with piceous teeth; anterior tibiae serrately dentate within, strongly widened inwards at apex and provided there with a large spongy fossa. (Type of genus, Pagasa pallidiceps Stål).

Pagasa is known only from the Nearctic and Neotropical realms. It is undoubtedly closely related to Prostemma Leon Dufour which is rich in species in the Palearctic regions. Our forms are often dimorphic in regard to wing development. The shape of the anterior legs, the length of the rostral segments, and the shape of the ostiolar canal vary much in the different species. Of the nine described species only three have been recorded from our region.

Key to Species of Pagasa.

I. Pronotum with a triangular ochraceous patch on anterior lobe at apex; anterior tibiae strongly curved inwards, gradually widened from base to apex. . . . . luteiceps (Walker), p.36.

Pronotum entirely piceous or nigro-piceous; anterior tibiae not curved inwards; the apex broadly and angularly dilated . . . . . II.

II. Segment II of rostrum extending beyond base of head; anterior tibiae broadly and suddenly dilated along apical two-fifths; hemelytra in greater part opaque. . . . . pallipes Stål, p. 37.

Segment II of rostrum scarcely attaining posterior margin of eyes; anterior tibiae angularly dilated within to apex; hemelytra shiny (fusca) . . . III.

III. Legs pale testaceous . . . . . fusca (Stein), p. 39.

Legs piceous black - - - var. nigripes Harris, p. 43.

Pagasa luteiceps(Walker)

1873. Prostemma luteiceps Walker, Cat. Hem. Heter. Br. Mus., VII, p. 135.

1900. Pagasa luteiceps Champion, Biol. Centr. Am., Rhyn. II, p. 298, Tab. XVIII, figs. 16, 16a.

1909. Pagasa luteiceps Reuter et Poppius, Acta Soc. Sc. Fenn., XXXVII, p. 27.

Oblong, smooth, pilose and somewhat setose, shiny, the scutellum and greater part of hemelytra opaque; piceous, the head and a triangular patch on apex of pronotum ochraceous, the scutellum and hemelytra excepting embolium and cuneus, ochraceous to testaceous, somewhat variegated. Antennae, rostrum and legs fusco-testaceous. Head slightly broader than long, embrowned beneath. Eyes large, the width of one less than width of vertex. Ocelli prominent, far apart. Antennae paler at base, segment I (16) scarcely as long as an eye; III almost twice as long as I, distinctly less than width of head thru eyes (31:34), supplementary segment (II) one-half as long as I. Rostrum reaching upon mesosternum, segment II not surpassing middle of eyes; III about a third longer than II.

Pronotum broader than long (macropterous male, 68:55); anterior lobe broad, about two and a half times as long as posterior lobe (median measurement); basal margin angularly emarginate. Scutellum large, with a few scattered punctures basally and two piceous foveae on disc, the apex slightly produced. Hemelytra clothed with somewhat reclining hairs, opaque, the embolium and costal margin of cuneus shiny brown;

the corium with one and the clavus with three rows of distinct punctures; membrane smoky, the veins paler. Anterior femora greatly incrassate, their length (measured beneath) about twice their thickness (43:21), the lower surface for its entire length densely spinose; anterior tibiae strongly curved inward, widened apically from the base, the inner surface beset with a row of curved piceous spines. Intermediate and posterior tibiae (the latter more sparingly) spinose and also setose. Metasternum longitudinally carinate down the middle. Metapleuron opaque, rugulose, the ostiolar canal distinct. Venter shiny. Clasper with the apex truncate (Plate III, fig. 2). Length, 6.6 mm.; width, 2.07 mm.

P. luteiceps is said to be closely related to the Brazilian species, P. pallidiceps Stål. It has heretofore been recorded from Mexico and Venezuela. The above description is made from a winged male from Tobago Id., Panama. This species may be readily separated from its congeners by its color markings, differently constructed anterior femora, and curved anterior tibiae. Nothing seems to be known regarding its biology.

Pagasa pallipes Stål.

1873. Pagasa pallipes Stål, Enum. Hemip., III, p. 108.

1899. Pagasa pallipes Champion, Biol. Centr. Amer., Heter., II, p. 299, Tab. XVIII, figs. 18, 18a.

1909. Pagasa pallipes Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, No. 2, p. 29.

1914. Pagasa pallipes Barber, Bull. Am. Mus. Nat. Hist., XXXIII, p. 502.

Moderately elongate, smooth, pilose, and also sparsely setose; shiny, the scutellum, central portion of hemelytra, and metapleura dull; nigro-piceous, the antennae, rostrum, and legs testaceous. Head equally as long as broad. Eyes large, width of one of them equal to that of vertex. Ocelli far apart. Antennae moderately long, segment I one-fourth shorter than an eye; III more than twice as long as I, subequal to width of head thru eyes; supplementary segment (II) about half as long as I; IV and V slender, thickly pilose; proportion of segments, I:II:III:IV:V = 15:7:35:36:40. Rostrum fairly long, segment II longest, surpassing apex of pronotum, its length greater than III of antennae; III and IV conjoined slightly longer than II.

Pronotum broader than long (macropterous male, 73:62), collar narrow, indistinctly marked off, anterior lobe long, transverse impression with a few punctures, posterior lobe slightly more than one-third as long as anterior, basal margin feebly sinuate inwards at the middle, Scutellum dull, with a few scattered punctures on the base, the disc bifoveate. Hemelytra dull, the embolium, costal margin of cuneus and outer portions of corium and clavus shiny; with rows of punctures as in luteiceps; membrane smoky, the veins rather indistinct. Anterior femora strongly incrassate, length about three times depth (50:17); armed beneath, excepting

apical and basal one-fourths, with two indistinct rows of piceous spines. Anterior tibiae broadly, angularly dilated on apical one-third, spinose within, the spongy fossa at apex about one-half as long as tibia itself. Intermediate and posterior tibiae with several stout spines along their inner surfaces. Venter on either side with a large submarginal impression at base of second segment, the impression fringed with long hairs, its bottom distinctly pitted. Clasper with the apex broadly rounded (Plate III, fig. 1). Length, 7.5 mm.; width, 2.2 mm.

Pallipes was originally described from Texas and has since been recorded from Florida, Kansas, and Utah. The above description is taken from a male and female (both macropterous) from San Antonio and Victoria, Texas respectively. Specimens from Dunedin and Royal Palm Park, Florida, collected by Professor W. S. Blatchley and from Brownsville, Texas have been seen by the writer. Hussey (1922) has recorded this species from Michigan but the author has yet to see a specimen from so far north. The nymphs are readily recognized by the enormously widened anterior tibiae, the apical fossa occupying more than half of the tibia in a fourth (?) instar nymph. The brachypterous form is said to have the hemelytra extending upon the second abdominal segment.

Pagasa fusca (Stein).

1857. Prostemma fuscum Stein, Berl. Ent. Zeit., I, p. 90.

1873. Pagasa nitida Stål, Enum. Hemip., III, p. 108.

1890. Pagasa fusca Reuter, Revue d'Ent., IX, p. 281.

1899. Pagasa fusca Champion, Biol. Centr. Amer., Heter., II, p. 299, Tab. XVIII, figs. 17, 17a.

1909. Pagasa fusca Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, p. 31.

Moderately elongate, smooth, setose, the antennae, hemelytra, legs, and venter also pilose; shiny, the scutellum and metapleura dull; piceous black, the posterior lobe of pronotum and hemelytra sometimes brownish; antennae, legs, and rostrum testaceous to flavo-testaceous. Head as broad as long. Eyes large, the width of one equal to that of vertex. Ocelli reddish, distinct, placed close to eyes. Antennae moderately long, segment I one-third shorter than an eye; III two and one-half times as long as I, equal to width of head thru eyes; IV and V slender, thickly pilose; proportion of segments, I:II:III:IV:V = 13:7:29:28:28. Rostrum fairly short, stout, segment II not surpassing middle of eyes, its length only two-thirds of that of antennal III; III subequal to II.

Pronotum as broad as or distinctly broader than long, the collar very narrow, anterior lobe long, transverse impression with a few punctures, basal margin angularly and rather deeply emarginate. Scutellum with a few punctures on base, disc with numerous semi-erect long hairs, the foveae shallow. Hemelytra shiny, the veins rather prominent; clavus without a distinct row of punctures along inner margin, but it and corium with other punctures as in

pallipes. Membrane smoky, when developed with three elongate cells from which numerous veins radiate. Anterior femora strongly incrassate, only about two and one-fifth times as long as thick (41:19), spinose beneath. Anterior tibia widened from apex outwards, spinose within, the fossa at apex distinctly less than one-half as long as tibia. Intermediate and posterior tibiae with a few elongate stout spines. Venter with only a faint impression at base of second segment on either side. Male clasper prolonged outwardly and upward at apex (Plate III, fig. 3).

Brachypterous form: Smaller, more elongate, the pronotum, scarcely as long as broad; hemelytra rather pointed, varying in length; abdomen conspicuously punctate. Length, 5.28 - 6.5 mm.; width, 1.5 - 1.8 mm.

Macropterous form: Pronotum distinctly broader than long (65:55). Membrane extending well beyond apex of abdomen. Length, 6.8 mm.; width, 1.95 mm.

Fusca was originally described from Pennsylvania. Its range is said to extend southward into South America. Specimens are at hand or have been examined from the following localities: Maine, New Hampshire, New York, New Jersey, Pennsylvania, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Mississippi, Kansas, Nebraska, South Dakota, Alberta, British Columbia, California, Arizona, Colorado, Texas, and Mexico. This species varies considerably in size. When the hemelytra are completely developed the mem-

brane extends beyond the apex of the abdomen. It may be reduced however to where it just fails to cover the abdomen or is even entirely lacking. In the latter case the hemelytra extends only to the middle of the second abdominal tergite and are truncate at the apex. Many gradations between these extremes in wing development have been seen.

Biology: P. fusca is one of the ground inhabiting nabids. It is to be found usually in hot dry situations where the vegetation is very short. Here it runs about hiding beneath chips and bunches of grass and feeding upon other insects that it can overpower. The writer has observed it feeding upon leaf-hoppers and upon specimens of the Lygaeid, Geocoris uliginosus (Say) which form is itself predatory in nature and inhabits similar situations to that preferred by P. fusca. In Mississippi he has taken it in company with Blissus leucopterous Say, and Myodocha serripes Oliv. The eggs are laid in the stems of plants. The nymphs are somewhat ant-like in appearance. The writer has taken the third instar (?) nymphs during the last week in May at Ames, and has had females deposit eggs in September which hatched within a few days in the writer's office. First and second instar nymphs have also been taken by the writer in Mississippi in September. Hibernation supposedly occurs in the adult form as a specimen labelled as having been taken beneath bark in January is at hand.

Pagasa fusca nigripes Harris.

1926. Pagasa fusca nigripes Harris, Ent. News, XXXVII, p. 287.

Similar in structure to typical fusca but easily recognizable by the deeper black color of the body and especially by the black legs. Known only from Pingree Park, Colorado.

Subfamily Nabinae (Reuter).

1873. Coriscina Stál, Enum. Hemip., III, pp. 106, 110.

1890. Arachnocorina Reuter, Rev. d'Ent., IX, p. 293.

1890. Nabina Reuter, Rev. d'Ent., IX, p. 293.

1904. Coriscidae Uhler, Proc. U. S. Nat. Mus., XXVII, p. 363.

1904. Nabidinaria Distant, Fauna Br. Ind., Rhyn. II, p. 397.

1908. Reduviolina Reuter, Mém. Soc. Ent. Belg., XV, p. 129.

1908. Nabinae Oshanin, Verz. Palae. Hemip., I, p. 568.

1909. Reduviolina Reuter et Poppius, Acta Soc. Sci. Fenn., XXXVII, No. 2, p. 3.

Elongate to sub-elongate. Head more or less exserted, with a distinct collum, the eyes rather far from pronotum. Ocelli distinct or absent. Eyes prominent. Antennae long, 4-segmented, often with an obsolete ring-like segment at base of II. Rostrum slender. Pronotum with apical collar wide and rather distinctly marked off; constricted at or before the middle, the base truncate or emarginate. Scutellum moderately large. Hemelytra with clavus widened posteriorly. Metapleuron with ostiolar orifice indistinct or well developed, in the latter case

the canal flattened and slightly curved forward or short and tuberculate. Anterior legs with coxae lengthened, femora more or less incrassate, tibia provided with an obsolete pad at the apex.

This subfamily contains by far the greater number of the North American species of Nabids. It is represented in our fauna by five genera.

Key to Genera.

I. Anterior coxae not greatly elongate; anterior acetabula open behind; ocelli, in our species, always present (Tribe Nabini Van Duzee) . . . . . II.

Anterior coxae slender, rather greatly elongate; anterior acetabula closed behind; ocelli, in our species, always ~~present~~ absent (Pl. III, fig. 13) (Tribe Gorpini Reut.) IV

II. Head short, strongly declivous; pronotum rather globose; scutellum small, the apex produced upwards into a distinct spine; ostiolar canal short, tuberculate . . . . . Arachnocoris, p. 45.

Head moderately long, porrect; pronotum campanulate; scutellum moderately large, the apex not produced into an upward directed spine; ostiolar canal flattened, directed outward onto mesopleuron III

III. Antennal I not twice as long as head, not suddenly thickened along apical third; membrane usually with closed discal cells; intermediate tibiae armed within with sharp spines or spine-like teeth . . . . . Nabis p. 53.

Antennal I twice as long as head, suddenly and evenly thickened along its apical third; membrane with unclosed discal cells; intermediate tibiae unarmed within. Metatropiphorus, p. 114.

IV. Scutellum equilateral; hemelytra strongly constricted before the middle; small species (less than 5 mm.) . . . . . .Carthasis, p. 119.

Scutellum elongate; hemelytra with costal margins parallel; large slender species (12 mm.) . . . . . .Neogorpis, p. 132.

Genus ARACHNOCORIS Scott.

1881. Arachnocoris Scott, Ent. Mo. Mag., XXVII, p. 272.

1890. Arachnocoris Reuter, Rev. d'Ent., IX, p. 292.

1894. Velidia Uhler, Proc. Zool. Soc. Lond. 1894, p. 206.

1908. Arachnocoris Reuter, Mém. Soc. Ent. Belg., XV, p. 129.

Body sub-elongate, shiny, pilose. Head short, rather strongly declivous. Eyes moderately large. Ocelli distinct. Antennae long, slender, pilose, segment I distinctly longer than head. Rostrum long, slender, extending onto metasternum; segment I twice as long as broad. Pronotum rather globose, strongly declivous anteriorly, only faintly constricted near the middle, the collar at apex well marked off; basal margin somewhat reflexed behind humeral angles, roundly emarginate at base of scutellum. Scutellum small, the apex produced into an acuminate spine. Hemelytra shiny, the clavus scarcely widened from base to apex of scutellum, the commissure longer than scutellum. Anterior legs with coxae only moderately long, femora of about equal thickness thruout their lengths, slightly curved, spinose beneath; tibiae slender, slightly longer than femora, somewhat curved, without apical pads. Mesopleuron shiny; metapleuron opaque,

rugulose, the ostiolar canal tuberculate. Abdomen greatly narrowed basally, almost petiolate. (Type of genus, Arachnocoris albomaculatus Scott).

Arachnocoris was erected in 1881 for two new species of Nabids from South America. Reuter in 1890 constructed a separate subfamily for this peculiar genus, which however, he later (1908) rejected upon the discovery of Pararachnocoris chloropterus Reuter* from British Guiana. This latter seems to be a connecting link between the genus Nabis and the genus Arachnocoris. As now known Arachnocoris contains six species ranging from Panama and the West Indies southward to Brazil.

Key to Species of Arachnocoris.

I. Smaller (2.5 mm.); legs yellow, the femora annulate with black . . . . . berytoides (Uhler), p.47.

Larger (4-5.5 mm.); legs piceous to rufo-piceous, sometimes with femora annulate with yellowish . . . .II.

II. Segment II of venter with a transverse white fascia; metapleuron in greater part fuscous. Male with greatly incrassate intermediate femora; the clasper strongly curved, claw-like. . . . . albomaculatus Scott, p.48.

Segment II of venter without transverse white fascia; metapleuron in greater part yellowish. Intermediate femora of male not greatly incrassate; the clasper slender lance-like...trinitatis Bergroth, p.51.

* Unfortunately Pararachnocoris was by typographical error spelled Parachnocoris originally and this error has been perpetuated in most of the literature. Reuter however, plainly meant, and he so states later, that the name should be Pararachnocoris.

Arachnocoris berytoides (Uhler).

1894. Velidia berytoides Uhler, Proc. Zool. Soc. Lond., 1894, p. 207.

"Long, subcylindrical, griseo-fuscous, widest at the base of the pronotum. Head highly polished, black at base and between the eyes, the face, cheeks, and rostrum yellow; the antennae dusky testaceous, annulated with black at the ends of the joints, and with a white band at the base of third and fourth joints, the basal joint with a broader black band a little way behind the tip. Pronotum greyish testaceous; the posterior lobe strongly punctate, the callosities black and polished, with a groove in the middle between them; the collum in front of these polished, yellow; the intrahumeral and the posterior border black, with the edge yellow; the pleural flaps punctate, pale yellow; humeri with a small whitish callosity in the angle. Scutellum mostly greyish yellow, with the apical point white. Legs yellow, all the femora with a black band before the tip, and the middle and posterior pairs, especially, marked with about three narrow black bands; the tips of tibiae and of tarsi also black. Venter smooth, dull flavo-testaceous, with a large spot on each side of base and the last two segments mostly black.

Length to tip of venter 2½ mm.; width of pronotum 2/3 mm.

Only one specimen was obtained. It was found at Balthazar, on April 24, at an elevation of 250 feet above

tide level, near the shady bank of a stream; beaten from a mass of bush and decaying leaves".

This species is known only by the type specimen in the British Museum of Natural History from Trinidad, West Indies. The above is Uhler's original description.

Arachnocoris albomaculatus Scott.

1881. Arachnocoris albomaculatus Scott, Ent. Mo. Mag., XXVII, p. 273.

1890. Arachnocoris albomaculatus Reuter, Rev. d'Ent. IX, p. 292.

1893. Herdonius panamensis Distant, Biol. Centr. Amer., Rhyn., I, p. 419, Tab. XXXVI, fig. 13.

1908. Arachnocoris albomaculatus Reuter, Mém. Soc. Ent. Belg., XV, p. 129.

1925. Arachnocoris albomaculatus Myers, Jour. N. Y. Ent. Soc., XXXIII, pp. 136-146, pl. VI.

Slender; pilose, shiny, piceous brown, the pronotum excepting collar and reflected basal margin black; apex of scutellum, a transverse fascia at apex of clavus (widening forwards on embolium to near the base), and apex of cuneus white. Under surface rufo-piceous, the gula, collar of pronotum beneath, margins of anterior and intermediate acetabula, a spot on base of mesopleuron and another on ostiolar canal, a broad fascia on basal half of second segment of venter, a median interrupted line on segments II and III of venter and the apical margin of segment IV beneath, and prominent callosed spots on the first four connexival segments white. Head short, as broad as long.

Eyes moderately large. Ocelli prominent, far apart. Antennae long, slender, pilose; flavo-testaceous, the median portion of segment II, all of III and the base of IV darker; segment I slightly longer than width of head thru eyes; proportion of segments, I:II:III:IV = 24:38:51:39. Rostrum piceous, the basal segment paler, more than twice as long as broad; II and III subequal, each equal to I of antennae; IV half as long as III, extending between hind coxae.

Pronotum thickly and coarsely punctate behind the transverse impression, with a few fine punctures in front; thickly clothed with short, even, erect pubescence; the basal margin behind the humeral angles paler, reflected, deeply emarginate in front of scutellum. Scutellum small, with a few erect fine hairs, its base impressed and finely punctate; the apical half white, spiniform. Hemelytra rather strongly constricted to a point opposite apex of clavus, smooth, shiny, the veins and the costal margin beset with a few fine hairs. Membrane smoky, densely clothed with very short, reclining pubescence. Anterior and intermediate legs piceous brown, the femora strongly punctate above, their apices and the tibiae and tarsi paler; the tibiae with an ivory spot on the outer surface near the base. Anterior femora of about equal thickness thruout, spinose beneath, somewhat curved posteriorly; anterior tibiae slightly longer than femora, thickest basally, unarmed within and without fossae at their apices. Intermediate femora greatly incrassate (male), spinose at the apex beneath; intermediate

tibiae slightly curved, thickest toward the base and there minutely spinose within. Metapleuron fuscous, opaque, rugulose. Venter rather strongly narrowed and somewhat keeled at base, finely punctate, pilose. Male clasper hook-like (Plate III, fig. 4). Length, 5.45 mm.; width, 1.25 mm.

A. albomaculatus was originally described from Rio Janeiro. The above description is made from a male specimen belonging to the Drake collection. It bears the label Tabernilla, Canal Zone, Panama, June 4, '07, Aug. Busck collector, and is undoubtedly the specimen that Bergroth (Ent. Mo. Mag., Vol. 50, 1914, p. 117) had previously listed from Panama. It differs from Scott's description in the proportions of the antennal and rostral segments, and in the absence of the spine on the posterior trochanters. Also it is to be noted that the color (Scott described it "Pitchy black") is more of a brownish, the pronotum alone being pitchy black. In the specimen before me the band on the base of the second segment of venter seems to extend even across on the dorsal side of abdomen. In view of the points that are at variance with Scott's description there would be some hesitation in identifying the specimen present as albomaculatus were it not for the fact that Reuter after examination of a specimen from Rio Janeiro pointed out that Scott had probably erred in his description of the antennae and rostrum. Bergroth who studied Scott's type at the British Museum concurred in this view

even tho he failed to recognize the sexes. In the specimen at hand the claspers are very prominent.

Biology: This remarkable insect is known to inhabit the webs of certain spiders where it lives suspended upside down apparently preying upon insects caught therein. Myers (1925) has published a rather full discussion of the peculiar body modifications and color schemes that so remarkably adapt the adult and its nymphs for such a life. Nothing is known of the eggs and younger instars.

Arachnocoris trinitatis Bergroth.

1916. Arachnocoris trinitatis Bergroth, Proc. U. S. Natl. Mus., LI, p. 232.

Closely related to A. albomaculatus but smaller and slightly paler; the males with very differently shaped claspers and without greatly incrassate intermediate femora. Head short, strongly declivent. Antennae fusco-testaceous, the base and apex of segment I, apex of II, and the apical two-thirds of IV pale to whitish; proportion of segments, 20:33:42:30. Rostrum piceous, extending between hind coxae; proportion of segments, II:III:IV = 22:19:11.

Pronotum less globose than in albomaculatus, the color distinctly paler than there (more of a brownish testaceous), the transverse impression much more distinct, the collar wider, and the basal margin more broadly emarginate. Scutellum about as in albomaculatus, the apical spine shorter. Hemelytra as in albomaculatus, the transverse band at apex

of commissure scarcely widened forwards on embolium. Legs piceous brown, the extreme apex of each femur and base of each tibia yellowish to reddish. Anterior and intermediate femora of about equal thickness, spinose beneath; posterior femora slender and curved, and with a rather broad, indistinct yellowish annulation before the distal third. All tibiae and tarsi very slender. Metapleuron in greater part yellowish; opaque, rugulose. Venter constricted basally as in albomaculatus, but less thickly pilose and the color paler, the second segment without the transverse white band and the median white line; the fifth segment with a prominent raised ivory submarginal spot on each side. Connexival segments marked as in albomaculatus, but the spots much smaller on the basal segments and more prominent on the fourth, fifth, and sixth segments. Genital segments large, the clasper rather long and lance-like (Plate III, fig. 7). Length 4.41 mm.; width, 1.04 mm.

This species was described from Trinidad, West Indes and is known only by the type specimens in the collection of the U. S. National Museum. The above description is made from two of the paratypes (both males) kindly sent to me for study by Mr. W. L. McAtee. They are labelled as having been taken at Montserrat, June 27, Aug. Busck, collector. These specimens agree quite well with Bergroth's description, but in neither is the second antennal segment twice as long as the first nor are the calloused ivory spots lacking on

the fourth and sixth connexival segments as that author states. The species is closely related to A. albomaculatus and undoubtedly has similiar habits.

Genus NABIS Latreille.

1802. Nabis Latreille, Hist. Nat. Ins., III, p. 248.

1807. Nabis Latreille, Genera Crust. Ins., III, p. 127.

1837. Reduviolus Kirby, Richardson's Fauna Bor. Am., IV, p. 279.

1840. Nabis Westwood, Intr. Mod. Classif. Ins., II, Synop., p. 120.

1873. Coriscus Stål, Enum. Hemip., III, p. 112.

1890. Nabis Reuter, Revue d'Ent., IX, p. 293.

1900. Reduviolus Kirkaldy, Entomologist, XXXII, p. 242.

Elongate-oblong, narrowed anteriorly; more or less opaque, pilose. Head rather long, horizontal, produced before and behind the eyes. Eyes large, well removed from apex of pronotum. Ocelli (in our species) distinct, about as far from eyes as from each other. Antennae long, pilose, segment I thickest, distinctly surpassing apex of head. Rostrum slender, segment I thick, as broad as long.

Pronotum strongly narrowed anteriorly, transversely constricted near the middle, the anterior lobe with a wide distinct collar; the posterior lobe usually arched, its basal margin truncate. Scutellum equilateral, somewhat impressed on the disc, with a smooth callosity on each side. Hemelytra often abbreviated; the membrane when developed

with three elongate cells from the margins of which numerous veins radiate. Legs long, the anterior femora incrassate, the anterior tibiae shorter from femora, dentate within and with a small fossa at apex. Metapleura dull, the ostiolar canal flattened, extending outward to middle of evaporative surface and curved anteriorly. (Type of genus, Nabis ferus Linn.).

The genus Nabis includes the most numerous and the better known members of the family occurring in North America. It is a large genus containing many species thruout its almost world-wide range. Reuter has divided the genus into several distinct groups or subgenera. Evidence at hand however, indicates that these may need to be recharacterized and this the writer hopes to do when more material from other faunal regions becomes available.

Key to the Subgenera and Species of Nabis.

I. Head behind the eyes parallel-sided or nearly so; body in greater part grey or brownish in color . . . . . II.

Head strongly and obliquely narrowed behind the the eyes; body shiny black, with antennae, rostrum, legs, and margin of connexivum yellowish. (Subgenus Nabicula Kirby). . . . . subcoleoptratus (Kirby), p. 59.

II. Anterior and intermediate femora armed beneath with minute short, rather blunt, piceous teeth; tibiae annulate thruout their entire length; (Subgenus Hoplistoscelis Reuter) . . . . . III.

Anterior and intermediate femora unarmed or with only minute piceous spine-like setae, never with short teeth; tibiae not annulate, or if so, only at the base and apex . . . . . VII.

III. Posterior tibia with numerous long hairs that arise at right angles from its surface, the hairs being about twice as long as tibia is thick . . . . . heidemanni Reut., p. 63.

Posterior tibia with numerous shorter hairs that arise at an acute angle and that are never twice as long as the tibia is thick . . . . . IV.

IV. First antennal segment equal to or slightly longer than width of head thru eyes; anterior femora at least four times as long as thick (depth) . . . . . sordidus Reut., p. 65.

First antennal segment less than width of head thru eyes; anterior femora less than four times as long as thick. . . . . V.

V. Anterior femora only three times as long as thick; size larger, 7-8 mm. . . . . dentipes n. n., p. 68.

Anterior femora more than three times as long as thick; size smaller . . . . . VI.

VI. Anterior femora three and one-third times as long as deep . . . . . nigriventris Stål, p. 70.

Anterior femora three and two-thirds times as long as deep . . . . . deceptivus n. sp.,p. 72.

VII. Posterior lobe of pronotum strongly punctate; hemelytra distinctly constricted before the middle, the costal margin ciliate; femora annulate before the apex; posterior tibiae clothed with long, sub-erect hairs. (Sub-genus Lasiomerus Reuter) . . . . . .VIII.

Posterior lobe of pronotum not or only very faintly punctate; costal margins of hemelytra about parallel, clothed with only a few shorter hairs; femora usually not annulate before apex; tibiae clothed with shorter hairs which arise at a sharp angle from its surface . . . . . XI.

VIII. Osticlar canal gently curved forward, flat, not sharply raised from the surface of the metapleuron; anterior lobe of pronotum not or only slightly arched; segments II and III of rostrum subequal in length; larger (6 mm. or more) IX

Osticlar canal directed posteriorly, high, distinctly and sharply raised from the surface of the metapleuron; anterior lobe of pronotum rather strongly arched; segment II of rostrum distinctly longer than III; small (3.6-3.9 mm.). . . . . panamensis Harris, p. 74.

IX. Body slender, elongate; anterior and intermediate femora each with a row of long, rigid, spine-like setae on the posterior surface below . . . . . spinicrus Reut., p.75

Body oblong to oblong-ovate; anterior and intermediate femora without rigid, piceous, spine-like setae X

X. Segment I of antennae about as long as pronotum, its length $1\frac{3}{4}$ times width of head thru eyes; larger (8-9 mm.) . . . . . annulatus Reut., p. 78.

Segment I of antennae distinctly shorter than pronotum, its length less than $1\frac{1}{2}$ times width of head thru eyes; smaller. . .constrictus Champ., p. 81.

XI. Body elongate; antennal I always distinctly longer than width of head thru eyes; scutellum with a prominent, depressed, semicircular, shiny spot on each side at the base; macropterous form rare. Brachypterous form with elytra not extending beyond third abdominal segment; abdomen pale above, nigro-vittate (subgenus Dolichonabis Reuter) . . . . . XII.

Body usually broader, oblong-ovate; scutellum with depressed shiny spots at base absent or only obsoletely developed; macropterous form common. Brachypterous form rarely with elytra not extending beyond middle of abdomen and then antennal I is scarcely or not longer than width of head thru eyes (subgenus Nabis Latr.). . . .XIV.

XII. Body greatly elongate; antennal I usually about four times as long as width of head between the eyes; anterior femora about six times as long as thick; length (male-female, 9-12 mm.). .propinquus Reut., p. 82.

Body shorter, the abdomen of female more expanded; length of antennal I not or scarcely more than three times the width of head between the eyes; anterior femora usually not more than five times as long as thick XIII

XIII. Length of segment II of rostrum slightly greater than width of head thru eyes; antennal IV distinctly longer than antennal I; brachypterous form with elytra truncate at apex. . . . limbatus Dahlb., p. 84.

Segment II of rostrum usually equal to width of head thru eyes; antennal IV shorter than I; brachypterous form with elytra obliquely narrowed and somewhat pointed at apex. . . .nigrovittatus Sahlb., p. 87.

XIV. First segment of antennae equal in length to width of head between eyes . . . . . gerhardi n. sp., p. 88.

First segment of antennae much longer than width of head between eyes . . . . . XV.

XV. Head somewhat narrowed behind eyes; scutellum with semicircular shiny spot in each basal angle distinct but obsoletely developed; brachypterous form most common, their hemelytra extending usually not beyond middle of abdomen . . . . . .XVI.

Head not narrowed behind eyes; scutellum without semicircular shiny spots at basal angles; smaller species (usually less than 8 mm.); brachypterous form with hemelytra always extending almost to or beyond apex of abdomen. . . . . XVII.

XVI. First antennal segment slightly longer than width of head thru eyes; head, anterior lobe of pronotum, and abdomen above in greater part black; male clasper with a backward projecting spine-like hook on the dorsal edge near base of blade . . . . . flavomarginatus Scholtz, p. 90.

First antennal segment slightly shorter than width of head thru eyes; head, anterior lobe of pronutum and abdomen above in greater part testaceous to brownish; male clasper without basal hook on blade . . . . . vanduzeei Kirk., p. 93.

XVII. First antennal segment shorter than width of head thru eyes; hemelytra concolorous dull yellowish brown with three brown spots on each, thickly clothed with short, recumbent, golden pubescence; male clasper with narrow, elongate, lancelike blade. . . . . lovetti Harris, p. 94.

First antennal segment equally as long or longer than width of head thru eyes (if shorter, then the color is greyish testaceous; hemelytra yellowish brown to greyish testaceous, often speckled or mottled with darker, sparsely clothed with yellowish to greyish pubescence; male clasper with broad blade . . . . . XVIII.

XVIII. Color in greater part yellowish to reddish brown; segment IV of antennae longer than segment I . .XIX.

Color in greater part grey to greyish testaceous; segment IV of antennae subequal to I or slightly shorter. . . . . XXI.

XIX. Head beneath in greater part fuscous to black; posterior tibiae dotted with fuscous; brachypterous form with closed cells in the membrane; male clasper with long sinuated stem . . . . . .roseipennis Reut., p. 96.

Head beneath in greater part yellowish to testaceous; posterior tibiae usually immaculate; male clasper with short rectangular stem XX

XX. First antennal segment thickened distally, somewhat sinuate above; brachypterous form common, usually with no closed cells in membrane; diameter of blade of male clasper greater than that of an eye viewed from above. . . . . rufusculus Reut., p. 99.

First antennal segment scarcely thickened distally, from above almost straight; brachypterous form unknown; diameter of blade of male clasper equal to that of an eye. . . . . .kalmii Reut., p. 101.

XXI. Length of first antennal greater than that of head, two-fifths greater than width of head thru eyes; body narrow, linear; hemelytra translucent, shiny, never speckled; legs concolorous with body; brachypterous form unknown...capsiformis Germ., p. 103.

Length of first antennal less than that of head, never more than one-fifth greater than width of head thru eyes; body broader; hemelytra often distinctly speckled with fuscous dots. XXII

XXII. Posterior tibiae usually dotted with fuscous; connexivum usually with black spots in basal angles of its segments, sometimes pale thruout (var. uniformis, n. var.); first antennal segment equal in length to width of head thru eyes; pronotum broader than long; diameter of blade of male clasper distinctly less than that of an eye viewed from above. . . . . .alternatus Pshly., p. 105.

Posterior tibiae always immaculate; connexivum pale thruout; length of first antennal less than width of head thru eyes, or if longer (N. ferus var. pallidipennis n. var.) then is the pronotum as long as broad and the hemelytra not speckled; male clasper with diameter of blade equal to that of an eye viewed from above XXIII

XXIII. Length of an eye equal to width of vertex; second antennal segment three-fourths longer than first. First antennal segment shorter, or greater (var. pallidipennis), than width of head thru eyes. Macropterous form most common....ferus Linn., p. 108.

Length of an eye slightly greater than width of vertex; second antennal segment only about one-half longer than first; length of first antennal segment always distinctly less than width of head thru eyes. Macropterous form unknown. . . . . inscriptus (Kirby), p. 111.

Nabis subcoleoptratus (Kirby).

1837. Nabicula subcoleoptrata Kirby, Richardson's Fauna Bor. Am., IV, p. 282.

1869. Nabis canadensis Provancher, Nat. Can., I, p. 211.

1872. Nabis subcoleoptratus Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 81.

1873. Coriscus subcoleoptratus Stål, Enum. Hemip.,III, p. 112.

1900. Coriscus subcoleoptratus Howard, U. S. Dept. Agr., Div. Ent.,Bull. 22, N. S., p. 27, fig. 20.

1901. Reduviolus subcoleoptratus Kirkaldy, Wien. Ent. Zeit., XX, p. 222.

1921. Nabis subcoleoptratus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 1.

Oblong-ovate, impunctate, thinly pilose; shiny black, a short line on vertex along inner margin of each eye (extending inward to ocelli), the antennae, rostrum, legs, margins of acetabula, and border of connexivum yellow to testaceous. Head a little longer than broad, slightly declivent in front, the post-ocular part rather long, strongly obliquely narrowed backwards. Eyes large, the width of one about equal to one-half of distance between them. Ocelli distinct placed slightly closer to eyes than to each other. Antennae long, clothed with short hairs, the apical segments more thickly so; segment I subequal to width of head thru eyes (42:43), proportion of segments, 42:74:70:45. Rostrum long, segment II subequal to or slightly longer than antennal I, III faintly longer than II. Legs long, the anterior femora thickest near the base, about four times as long as deep, thickly clothed beneath with short hooked hairs; intermediate femora with piceous spinules within. Venter rather thickly pilose. Male rather elongate-ovate; genital segments large, the clasper with a broad stem and broad semicircular blade (Plate I, fig. 1).

Brachypterous form: Pronotum subconical, longer than broad, the anterior lobe arched. Scutellum small. Hemelytra reaching to middle of second abdominal segment, obtusely rounded at apex; membrane narrow, its veins indistinct. Length (male-female), 8-9.5 mm.; width, 1.62 - 1.75 mm. (at abdomen, 3-3.8 mm.).

Macropterous form: Pronotum broader than long, the posterior lobe finely punctulate. Scutellum rather large, with a yellowish spot on either side of disc behind the middle. Hemelytra extending scarcely to or slightly beyond apex of abdomen, brownish black; membrane large, with three elongate closed discal cells. Wings with hamus arising at origin of decurrent vein. Length, (female) 9.8 mm.; width, 2.28 mm. (at abdomen, 3.8 mm.).

Subcoleoptratus is one of the most common and best known members of the genus Nabis wherever it occurs. It constitutes according to Reuter a distinct subgenus (Nabicula Kirby) distinguishable by the shiny black color and the posteriorly narrowed hind portion of the head. Nabis (Nabis) vanduzeei Kirk. however, approaches it very closely in this last character. The long winged form occurs very seldom and is rare in collections. Of hundreds of specimens examined by me scarcely more than a dozen have been macropterous and then all of these were females. Perhaps the males never occur with fully developed wings. The yellowish markings vary from flavo-testaceous to dark testaceous and sometimes the connexival margin even shows a tendency

toward a crimson. The lengths of the antennal segments vary considerably. Specimens have been examined from the following localities: Quebec, Maine, New Hampshire, New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Kansas, Colorado, South Dakota, North Dakota, Alberta, and British Columbia. The species is recorded by Van Duzee from Texas, but I have never seen a specimen from so far south.

Biology. The writer has worked out the complete life history of N. subcoleoptratus as it occurs in Iowa. Here the winter is spent in the egg stage within the stems of grasses. The eggs begin to hatch during the last week of April and the first of May and some of the nymphs have reached the imago stage by the first week of June. There are five nymphal instars. The nymphs are remarkably myrmecoid in appearance and often are to be found running about in company with ants. The ant-like appearance is produced by the color scheme - there being a white patch at the base of the abdomen on each side which, in contrast with the black body, causes the abdomen to appear strongly petiolate. Furthermore the nymphs have a peculiar ant-like movement. The younger ones remain close to the ground but as they become older they spend the greater part of their time wandering up and down the stems of plants in search of prey. When thus occupied if they are disturbed by one wading thru the grasses or sweeping with a net they will release their hold

and fall to the ground. As in the nymphs (and adults) of all other nabids known to the writer, those of subcoleoptratus have well developed tibial combs and they not infrequently draw an antennae or the rostrum thru the apposed tips of the fore tibiae or to brush the body with a mid or hind tibia. At Ames the species inhabits shady meadows and the margins of woods and streams. Its life cycle here seems to closely parallel that of the meadow plant bug (Miris dolobratus Linn.) which frequents similar situations and whose nymphs furnish abundant food for those of subcoleoptratus. There is only one generation per year.

Nabis heidemanni (Reuter).

1908. Reduviolus heidemanni Reuter, Mém. Soc. Ent. Belg., XV, p. 100.

Oblong or oblong-ovate, fuscous to fusco-testaceous, opaque, pubescent, also thickly pilose. Head about as broad as long, with two posteriorly converging fuscous lines above. Eyes large, the length of one equal to width of vertex. Ocelli placed closer to eyes than to each other. Antennae long, testaceous, segment I at base and II before the apex with fuscous rings; segment I equal to width of head thru eyes (40:40); proportional lengths, 40:75:66:40. Rostrum with segments II and III subequal, each slightly longer than I of antennae (45:40).

Pronotum with a distinct median longitudinal line and more or less distinct pattern on anterior lobe, and five obscure lines on posterior lobe fuscous. Scutellum

with a calloused white spot on each side. Hemelytra with moderately long, semierect pubescence, somewhat irregularly spotted with brownish fuscous, the veins lighter and often tending to crimson. Legs clothed with prominent erect or semierect hairs, fusco-maculate, the tibiae distinctly annulate. Anterior and intermediate femora armed beneath with distinct short grain-like teeth, the former about $3\frac{1}{2}$ times as long as thick. Posterior tibiae with its longer hairs about twice as long as the diameter of the tibiae and standing out almost perpendicularly. Abdomen above densely clothed with prostrate, silvery, sericeous, pubescence; with a distinct naked patch at the base of each tergite in the median line, also each tergite on either side with a transverse naked patch. Connexivum testaceous sometimes obscurely marked with crimson, the segments each with a basal fuscous patch. Venter with a broad stripe on each side and a narrow median one fuscous, each segment with a conspicuous naked patch on either side next the connexivum. Male narrow, rather elongate; the clasper slender with a long blade (Plate I, fig. 2).

Brachypterous form: Pronotum as broad as long (male, 51:52; female, 63:63), the anterior lobe rather strongly arched. Hemelytra extending onto the base of third dorsal segment, broadly rounded or almost truncate at apex; membrane very small, without veins. Length, 7.2-8.7 mm.; width, 1.56-1.92 mm. (abdomen, 2.7-3.6 mm.).

Macropterous form: (female). Pronotum distinctly broader than long (80:63). Scutellum much larger than in brachypterous form. Hemelytra extending scarcely to tip of abdomen, obliquely narrowed from a point opposite middle of commissure; membrane with veins fuscous, broad and prominent. Length, 8.88 mm.; width, 2.28 mm. (abdomen, 3.5 mm.).

This is a distinct, easily recognizable species, originally described from California and heretofore known only from there. The above description is made from three specimens, the only examples that I have seen. These are, a brachypterous male (cotype) from Los Angeles, California (belonging to the U. S. National Museum), a brachypterous female from Mt. Moscow, Idaho, Oct. 10, 1916, A. C. Burrill, collector, and a macropterous female from Berkley, California, Sept. 9, 1919, Henry Dietrich, collector. Nothing is known of the biology.

Nabis sordidus Reuter.

1872. Nabis sordidus Reuter, Öf. Vet. Akad. Förh.,XXIX, No. 6, p. 86.

1872. Nabis pallescens Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 85.

1873. Coriscus sordidus Stål, Enum. Hemip., III, p. 112.

1873. Coriscus pallescens Stål, Enum. Hemip., III, p. 112.

1890. Nabis pallescens Reuter, Rev. d'Ent., IX, p. 298.

1890. Nabis sordidus Reuter, Rev. d'Ent., IX, p. 299.

1899. Nabis sordidus Champion, Biol. Centr. Amer.,Heter., II, p. 303, Tab. XVIII, figs. 26, 27, 28.

1908. Reduviolus sordidus Reuter, Mém. Soc. Ent. Belg., XV, p. 100.

1921. Nabis sordidus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, figs. 3, 4.

Elongate to oblong-ovate; sordid pale testaceous, with fuscous markings in general as in N. heidemanni. Head slightly longer than broad. Eyes prominent, the length of one equal to width of vertex. Ocelli closer to eyes than to each other. Antennae with segment I slenderer than in related species, usually slightly longer than width of head thru eyes; formula, 32:45:42:40. Rostrum with segment II and III subequal, each equal to or slightly longer than antennal I. Anterior and intermediate femora armed as in heidemanni, the teeth slightly longer and more prominent. Anterior femora four times as long as thick (60:15). Posterior tibiae with the hairs arising at a sharp angle from its surface. Abdomen above less densely clothed with silvery pubescence, the naked spots as in heidemanni. Venter with the denuded spots not so large and conspicuous. Male clasper longer and slenderer than in related species (Plate I, fig. 3).

Brachypterous form: Pronotum slightly longer than broad (male, 36:39; female, 42:46), the anterior lobe arched. Scutellum small. Hemelytra extending to middle of second dorsal segment; the membrane very short, without distinct veins, somewhat sharply rounded behind. Length, 6.3-6.6 mm.; width, 1.2-1.3 mm. (at abdomen, 1.68-2.4 mm.).

Macropterous form: Pronotum broader than long (male, 54:48; female, 62:52), the fuscous markings on the posterior lobe tending to form a circle on disc. Hemelytra extending scarcely to the tip of the abdomen or far beyond it; the disc with a raised white spot at the distal end of the suture separating corium and embolium; the outer apical portion with a more or less distinct castaneous patch. Length, 6.6-8.1 mm.; width, 1.5-1.8 mm. (at abdomen, 1.8-2.4 mm.).

This is the most common member of the subgenus Hoplistoscelis. Specimens have been examined from New York, Maine, Massachusetts, New Jersey, Pennsylvania, Ohio, Illinois, Wisconsin, Minnesota, Iowa, Nebraska, Missouri, Mississippi, Florida, Texas, Mexico, Guatemala, Panama, Hayti, Cuba, and Grenada. The species varies in color from the typical sordid testaceous to a very light testaceous or even to flavo-testaceous. The antennal segments vary somewhat in length in specimens from various localities as also does the thickness of the anterior femora. In the development of the hemelytra there is also a great variation, specimens from Mexico and Hayti have the membrane extending well beyond the apex of the abdomen while in other macropterous examples, from Iowa, it does not reach the apex of the abdomen. The short winged form is the much more common.

Biology. The writer has worked out the life history of N. sordidus as it occurs in the vicinity of Ames. The winter is spent in the adult stage, individuals hibernating beneath leaves, grasses, logs, and in other suitable

places. These adults become active in early spring (mid-April) and the females are soon depositing eggs in the stems of plants. There is evidence to indicate that the females or at least some of them (also those of N. roseipennis Reut.) are fertilized in the fall previous to their entering into hibernation. The egg stage lasts for about two weeks. There are five nymphal instars. The total lapse of time from oviposition to transformation to adult, in the writer's experiments, varied from 33 to 37 days. The habits of the nymphs are in most ways similar to those of the other species of the genus. Sordidus frequents shady moist situations where the undergrowth is of a rank nature. It is often parasitized by a large red mite.

Nabis dentipes new name.

1872. Nabis crassipes Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 83 (name preoccupied).

1873. Coriscus crassipes Stål, Enum. Hemip., III, p. 112.

1876. Coriscus crassipes Uhler, Bul. U. S. Geol. Surv., I, p. 325.

1890. Nabis crassipes Reuter, Rev. d'Ent., IX, p. 297.

1899. Nabis crassipes Champion, Biol. Centr. Am., Heter., II, p. 302, Tab. 18, figs. 22, 23, 24.

Oblong to ovate, pubescent; brownish to fusco-testaceous, the general markings as in other members of the subgenus. Head slightly broader than long. Eyes prominent, the length of one slightly less than width of vertex. Ocelli about equally as far apart as from the eyes. Antennae rather elongate, segment I thickened distally,

its length distinctly less than width of head thru eyes (30:36); proportion, 30:46:42:(absent). Rostrum with segments I and II subequal, each slightly longer than antennal I. Scutellum with the usual pallid spot on either side. Hemelytra somewhat castaneous. Anterior and intermediate femora armed beneath as in other members of the subgenus, the teeth smaller than in sordidus, rather inconspicuous. Anterior femora rather strongly incrassate, not more than three times as long as deep (61:21). Posterior tibia with its longest hairs about equal in length to its diameter, these hairs arising at an acute angle. Male smaller and less ovate than female, the genital segment very large, with distinctive clasper (Plate I, fig. 4).

Brachypterous form: (male) Pronotum slightly wider than long (65:59), the anterior lobe arched. Hemelytra extending to middle of last abdominal segment, the membrane narrow, its length about twice that of claval commissure. Length, 7.2 mm.; width, 1.86 mm. (at abdomen, 2.7 mm.).

Macropterous form: (female). Pronotum much broader than long (72:59). Hemelytra extending beyond abdominal apex; membrane about three times as long as claval commissure, its veins prominent, fuscous. Length, 7.8 mm.; width, 2.1 mm. (at abdomen, 2.85 mm.).

This species was originally described as N. crassipes from a brachypterous female from Mexico. Unfortunately however, the name crassipes is preoccupied in the genus, hav-

ing been used by Schrank in 1801, and now stands as a synonym of N. ferus Linn. The above description is taken from two specimens, male and female, from Cuernavaca, Morelos and Chilpancingo, Guerrero, Mexico, respectively. Both specimens were before Champion, who examined Reuter's type, when he made his notes on this species for the Biologia Centralia Americana. Champion's artist failed to show the genital segments in his figure of the male. In both specimens before me the pronotum has a distinct inverted V-shaped fuscous design on the disc of the posterior lobe, the apex of the V being continuous with the median line of the anterior lobe. In the male the fuscous patches occupy much the greater part of the connexival segments. This species has been recorded, other than Mexico, from Georgia, Texas, and California. It seems to the writer that the Georgia record was undoubtedly made thru a misidentification and that it probably should refer to N. deceptivus n. sp. described below. Nothing concerning the biology of the species is known.

Nabis nigriventris Stål.

1862. Nabis nigriventris Stål, Stet. Ent. Zeit., XXIII, p. 458.

1872. Nabis sericans Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 83.

1873. Coriscus nigriventris Stål, Enum. Hemip., III, p. 114.

1890. Nabis sericans Reuter, Rev. d'Ent., IX, p. 296.

1899. Nabis nigriventris Champion, Biol. Centr. Amer., Heter., II, p. 302, Tab. XVIII, figs. 25, 25a.

1909. Reduviolus nigriventris Reuter, Mém. Soc. Ent. Belg., XV, p. 99.

1921. Nabis nigriventris Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 2.

Similar to N. dentipes but smaller and less robust. Head equally as broad as long. Eyes large, the length of one equal to width of vertex. Ocelli equally as far from eyes as from each other. Antennae shorter than in any other member of the subgenus, segment I distinctly less than width of head thru eyes (22:29); proportional lengths of segments, 22:39:35:35. Rostrum with segments II and III subequal, each distinctly longer than antennal I. Anterior and intermediate femora armed beneath as in other members of the subgenus, the teeth distinctly smaller and more inconspicuous than in sordidus. Anterior femora about 3-1/3 times as long as thick (50:15). The posterior tibiae clothed as in sordidus. Venter with the denuded shiny patches at base of connexivum larger and more conspicuous than in sordidus. Male narrower than female, the clasper distinctive (Plate I, fig. 6).

Macropterous form: Pronotum broader than long (male, 58:48; female, 63:52), the fuscous markings of the posterior lobe tending to form a circle on the disc as in winged examples of sordidus. Hemelytra with a castaneous tinge thruout; membrane extending well beyond apex of abdomen, smoky, its veins fuscous and prominent. Length, 6.6 - 6.9 mm.; width, 1.6 - 1.74 mm. (at abdomen, 2-2.4 mm.).

The brachypterous form is unknown to me. In the types (brachypterous) the hemelytra were said to be slightly more than twice as long as the scutellum, broadly rounded at the apex, the membrane narrow and without veins. The above description is taken from a macropterous male and female from Quezaltenango and Cuernavaca, Mexico respectively. They were before Champion when he examined the types of nigriventris, and its synonym sericans Reuter, for his notes on this species. N. nigriventris has been confused in collections with both N. dentipes and N. sordidus but is distinctly smaller than the former and is more robust and darker in color than is the latter. Seven winged specimens are at hand, all from Mexico, excepting a male from Huachuca Mts., Arizona (July 13, 1905, H. G. Barber). This species is also recorded in the literature from Colorado, Texas, Guatemala, and St. Vincent. The records under this name from the eastern and southeastern states refer to the following closely related form, N. deceptivus, n. sp.

Nabis deceptivus, n. sp.

Similar to N. nigriventris Stål but larger, with longer antennae, rostrum, and legs and differently constructed clasper of the male. Head slightly longer than broad. Eyes larger than in nigriventris, the length of one slightly more than width of vertex. Antennae with segment I less than width of head thru eyes (26:32); the proportional length of segments, 26:45:40:38. Rostrum with segment II

longer than I of antennae (33:26). Pronotum broader than in nigriventris, the collar more sharply marked off in front. Anterior femora more than 3-1/3 times as long as deep (58:16). Male with genital segment prominent, the clasper with a broad blade and bearing a distinct projection on the lower margin (Plate I, fig. 5).

Brachypterous form: Pronotum almost equally as long as broad (male, 47:49; female, 52:53). Hemelytra extending to middle of second dorsal abdominal segment; membrane minute, without veins. Length, 6.3-6.9 mm.; width, 1.32-1.62 mm. (at abdomen, 2.16-2.76 mm.).

Macropterous form: Pronotum distinctly broader than long (male, 63:56; female, 70:60), the anterior lobe feebly arched in front. Hemelytra extending well beyond tip of abdomen, with a distinct roseate tinge thruout. Length, 7.8 mm.; width, 2.1 mm. (at abdomen, 2.34-2.7 mm.).

Holotype, apterous male, Brownsville, Texas, Dec. 16, 1911. Allotype, apterous female, Prairie, Mississippi, July 27, 1921, C. J. Drake collector. Morphotypes, winged male, Knoxville, Tennessee, Feb. 27, 1892 and winged female, Texas. Paratypes, several brachypterous and macropterous males and females from following localities, Knoxville, Tenn., June 15, 1890, H. E. Summers; Gainesville, Florida, Aug. 7, 1918, C. J. Drake; Agr. College, Miss., July 22, 1921, C. J. Drake; Olive Branch, Illinois, Sept. 5, 1923, Owen Bryant; Brownsville, Texas, Nov. 7, 1906, J. D. Mitchell;

Chespeake Beach, Maryland, O. Heidemann. Types in author's collection, paratypes in collection of U. S. Natl. Museum, Iowa State College, C. J. Drake and the author.

N. deceptivus is very closely related to N. nigriventris Stål and has been labelled under that name by the author and others in collections. The differences pointed out however are constant thruout the series of specimens at hand and there seems to be no reason to longer junk the two forms together. The species may prove to be the form described from Texas by Reuter as Nabis sericans but as Champion had a cotype of that before him when he compared Stål's type of nigriventris with the specimens described above as nigriventris it seems best to give this form a new name.

Nabis panamensis Harris.

1926. Nabis panamensis Harris, Proc. U. S. Natl. Mus., LXIX, Art. 21, p. 3.

Small, oblong, pubescent; testaceous, a median line on head and on pronotum (obsoletely), sides and humeri of pronotum, tip of scutellum, veins of hemelytra, basal segments of venter, segment I of rostrum, and subapical patch on femora embrowned. Head short; eyes large, coarsely granular, the length of one greater than width of vertex. Ocelli inconspicuous. Segment I of antennae greater than width of head thru eyes (20:16); proportion of segments, 20:24:20: (IV absent). Rostrum with segment II subequal to I of antennae; III distinctly shorter than II.

Pronotum broader than long (35:31), the collar, sides, and posterior lobe coarsely punctate, the anterior lobe rather strongly arched. Scutellum bifoveate on the disc, raised before the apex. Hemelytra constricted to opposite middle of clavus, ciliate along costal margin basally; the clavus and corium coarsely punctate along the veins at the base. Membrane extending well beyond the tip of abdomen. Legs moderately slender; anterior femora about $4\frac{1}{2}$ times as long as thick (33:7). Genital segments prominent; the clasper with long stem. (Plate I, fig. 11). Length, 3.9-4.2 mm.; width, 1.02 mm. (at abdomen, 1.08-1.2 mm.).

This is the smallest Nabis occurring in our fauna. The above description is taken from the types, the species being known only from the type locality, Porto Bello, Panama. Panamensis is here placed in the subgenus Lasiomerus Reuter even tho it has certain pronounced differences from other members of the subgenus. Chief of these differences is the shorter postocular portion of the head, more arched anterior lobe of pronotum, punctate mesopleura, and differently constructed ostiolar canal. The short winged form is not known to occur.

Nabis spinicrus Reuter.

1890. Nabis spinicrus Reuter, Rev. d'Ent., IX, p. 305.

1894. Coriscus signatus Uhler, Proc. Zool. Soc. Lond., 1894, p. 205.

1899. Nabis signatus Champion, Biol. Centr. Am., Rhyn., II, pp. 302, 304, Tab. XVIII, figs. 31-33.

1908. Reduviolus spinicrus Reuter, Mém. Soc. Ent. Belg., XV, p. 103.

Slender, elongate, pilose; testaceous, the sides of head and also a median line thereon, a pattern on anterior lobe of pronotum, five longitudinal stripes on the posterior lobe, disc of scutellum, sides of thorax, and a submarginal stripe on each side of venter infuscated. Antennae with an apical ring on segment II and all of III and IV fuscous. Legs pale, with a subapical ring on femora, and a ring before the base and another at the apex of tibiae brown. Connexivum often with the basal angles of its segments embrowned. Head long, much longer than broad, the postocular part parallel-sided. Eyes prominent, the length of one subequal to width of vertex. Antennae long, segment I much longer than width of head thru eyes (42:24); proportion of segments, 42:57:63:55. Rostrum long, segments II and III subequal, each about 1/4 shorter than antennal I. Pronotum with the collar, sides, and posterior lobe finely punctate. Legs slender, anterior femora about 7 times as long as thick, provided on the sides below with a row of dark spots from each of which arises a long, tapering, spine-like seta; intermediate femora also with a row of spine-like setae on the posterior margin below; posterior tibiae finely pubescent and also beset with numerous very long rigid hairs. Male with genital segment prominent; the clasper hook-like (Plate I, fig. 7).

Brachypterous form: Ocelli very indistinct. Pronotum distinctly longer than broad (36:22). Hemelytra extending to base of first abdominal segment, sharply rounded and divaricating apically, without trace of membrane. Length, 6.3-6.7 mm.; width, .67-.79 mm. (at abdomen, .84-1.08 mm.).

Macropterous form: Ocelli prominent. Pronotum about as broad as long (40:39). Hemelytra extending slightly beyond apex of abdomen, the inner and outer apical angles, an elongate spot on commissure and another on corium opposite the commissure infuscated; membrane with veins prominent, extending to margin without forming closed cells. Length, 6.3-7.4 mm.; width, 1.14-1.32 mm. (at abdomen, 1.02-1.32 mm.).

Spinicrus is readily separated from our other known American nabids by the spine-like setae on the anterior and intermediate femora. In the females the spines are also present on the anterior tibiae, two rows of them, 5 spines in the row on the anterior surface and 4 in that of posterior surface. The fuscous markings are often more or less obsolete. The hemelytra are constricted before the middle and are ciliate on the costal margin towards the base. The shorter hairs clothing the anterior tibiae and the anterior femora beneath are distinctly hooked in character. In addition to the shorter hairs on the lower surface of the anterior and intermediate femora there are also numerous minute, piceous spinules. Specimens have been seen from Panama, Guatemala, British Guiana, Grenada, St. Vincent, Hayti, Cuba, and Florida. The Florida specimens are lighter in color with the darker markings more pronounced than in other specimens, also are their appendages slightly shorter. Spinicrus is also recorded from Mexico, Brazil and Peru. The record of Bueno from Brownsville, Texas (Ent. News, XXIII,

Macropterous form: Ocelli prominent. Pronotum about as broad as long (40:39). Hemelytra extending slightly beyond apex of abdomen, the inner and outer apical angles, an elongate spot on commissure and another on corium opposite the commissure infuscated; membrane with veins prominent, extending to margin without forming closed cells. Length, 6.3-7.4 mm.; width, 1.14-1.32 mm. (at abdomen, 1.02-1.32 mm.).

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p. 126, 1912) must stand as questionable as a specimen from that locality labelled in his collection N. signatus Uhler is a typical N. capsiformis Germar. Cotypes of signatus are before me. Blatchley records the capture of specimens by sifting plant debris from the margin of a pond, while Uhler records his specimen as taken from open weedy places near a stream.

Nabis annulatus Reuter.

1872. Nabis annulatus Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 86, Pl. VIII, fig. 4.

1873. Coriscus annulatus Stål, Enum. Hemip., III, p. 112.

1890. Nabis annulatus Reuter, Rev. d'Ent., IX, p. 305.

1921. Nabis annulatus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 5.

Moderately large, oblong; pilose; flavo-testaceous to testaceous, with the brown to fuscous markings as in spinicrus but more pronounced, often with crimson patches on the sides of the scutellum, the subapical part of the corium, the outer apical angle of the third connexival segment above, and along the sides of the venter. Head longer than broad, the postocular part parallel-sided. Eyes large, the length of one subequal to width of vertex. Ocelli prominent, placed about equally as far from eyes as from each other. Segment I of antennae much longer than width of head thru eyes (48:27); proportion of segments, 48:76:69:55. Rostrum with segments II and III subequal, each much shorter than antennal I (38:48).

Pronotum broader than long (male, 57:48; female, 69:56), the collar, sides, and posterior lobe coarsely punctate; Scutellum impressed on the disc. Hemelytra ciliate on the costal margin toward the base, constricted to a point opposite middle of commissure; the membrane extending beyond apex of abdomen, with three elongate closed cells. Legs rather long, anterior and intermediate femora provided beneath with numerous minute, piceous spinules which are more or less obscured by the thick clothing of longer hooked hairs; anterior femora about six times as long as thick; posterior tibia clothed with short outwardly slanting pubescence and with numerous much longer almost erect, fine hairs. Segments of venter with small denuded shiny spots on each side at the base of connexivum. Male genital segments long, the clasper with a hook-like blade (Plate I, fig. 8). Length, 8.04-9.18 mm.; width, 1.68-1.98 mm. (at abdomen, 1.98-2.52 mm.).

Annulatus was originally described from Illinois and is now known to occur thruout the eastern portion of the United States. Specimens have been examined by the author from Ontario, New York, New Jersey, Massachusetts, Pennsylvania, Ohio, Indiana, Illinois, Minnesota, Iowa, Mississippi, Missouri, and North Carolina. Examples from more southern localities are lighter in color with more pronounced crimson markings than those from farther north. The antennal segments vary slightly in length. The species is most closely related to the following, N. constrictus Champ., from which

it may be separated by its larger size and the shape of the clasper. The mesosternum is longitudinally sulcate as in all (?) other members of the genus. The spine-like setae on the legs of the related N. spinicrus are represented in annulatus by slender hairs.

Biology: N. annulatus is to be found inhabiting shady woods where the undergrowth is rather rank. The species is a rapid-flying one and a collector who would take them must be ever on the alert as he opens his net to examine the contents. Annulatus apparently overwinters in the egg stage. The nymphs and adults, like those of other species frequenting shady moist situations (sordidus and roseipennis), are often parasitized by a large red mite. The adult males spend a great portion of their time in the act of stridulation. During the writer's field observations he once observed an individual so occupied. The beating or stroking of the tibia was halted at intervals. After a few moments another individual appeared on the plant adjacent to the one upon which the male was perched. It was a female and she slowly advanced in the direction of the stridulating male, her every movement, so far as the writer was able to judge, giving the impression of awareness of the male. When she had gained the same plant as that upon which the male was stationed that individual utilized the intervals between his acts of stridulating to move forward a few steps. Finally the two stood upon the same leaf. The male ceased his stridulating and stood slowly moving his antennae. Suddenly there

was a quick movement and he had seized the female and was trying to effect accouplement. The writer has judged from this and other observations that the stridulating of the male must produce some sound that is perceptible to the female.

Nabis constrictus Champion.

1900. Nabis constrictus Champion, Biol. Centr. Am.,Rhyn., II, p. 303, Tab. XVIII, figs. 29, 30.

1908. Reduviolus constrictus Reuter, Mém. Soc. Ent. Belg., XV, p. 103.

1916. Nabis constrictus Barber, Jour. N. Y. Ent. Soc. , XXIV, 4, p. 308.

Very similar to annulatus but distinctly smaller, with shorter appendages, and differently constructed male clasper; the crimson markings of hemelytra usually present as a prominent line along apical margin of corium and an interrupted submarginal stripe extending for almost the entire costal length. Segment I of antennae longer than width of head thru eyes (35:24); the segments in proportion, 35:53:50:48. Rostral segments II and III subequal, each shorter than antennal I (31:35). Pronotum broader than long (male, 48:40; female, 51:43). Legs as in annulatus, but shorter. Male clasper distinctive (Plate I, fig. 9). Length, 6.6-7.5 mm.; width, 1.38-1.56 mm. (at abdomen, 1.74-1.98 mm.).

This pretty little species is very closely related to N. annulatus. It was described from Mexico, Guatemala, and Panama and has since been recorded from District of Columbia and Florida. The author has seen specimens from

Guatemala, Honduras, Mexico, Florida, Maryland, District of Columbia, and Virginia. The crimson markings of the hemelytra are often obsolete as also are the fuscous patches on the connexival segments. The brachypterous form, as in annulatus, is unknown. Nothing is known of the biology. Blatchley records the capture of two specimens by beating bunches of Spanish moss near the margin of a Florida lake.

Nabis propinquus Reuter.

1872. Nabis propinquus Reuter, Öf. Vet. Akad. Förh., XXIX, p. 87.

1872. Nabis vicarius Reuter, Öf. Vet. Akad. Förh., XXIX, p. 87, pl. 8, fig. 6.

1873. Coriscus propinquus Stål, Enum. Hemip., III, p. 113.

1890. Nabis propinquus Reuter, Rev. d'Ent., IX, p. 308.

1907. Nabis elongatus Hart, Bull. Ill. St. Lab. Nat. Hist., VII, p. 262.

1908. Reduviolus propinquus Reuter, Mém. Soc. Ent. Belg., XV, p. 105.

1921. Nabis propinquus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 6.

Slender, greatly elongate, pubescent; testaceous, an interrupted median line extending from base of tylus to tip of abdomen and a broad stripe on either side of body for its full length fuscous. Femora fusco-maculate. Head long, more than a third longer than broad, faintly widened behind the eyes. Eyes only moderately large, the length of one equal to width of vertex (14). Ocelli prominent. Antennae long, darkened distally, segment I much longer than width of head thru eyes (52:31); proportion of segments, 52:82:76:63. Rostrum with segments II and III subequal,

each much shorter than I of antennae (36:52).

Pronotum with long collar, the anterior lobe with the cicatrices darkened; the posterior lobe finely punctulate. Scutellum with a prominent, semicircular, shiny spot on either side basally. Abdomen above with an interrupted fuscous stripe to either side of the median dark line; the connexivum horizontal. Legs long, the anterior and intermediate femora thickly clothed beneath with short hooked hairs and more thinly so with shorter piceous spinules; anterior femora about six times as long as thick; posterior tibiae clothed with short hairs. Male narrower than female, the genital segments long, prominent, the clasper distinctive (Plate II, fig. 1). Female with abdomen rather sharply angular at apex, the apical margin of last abdominal segment angularly emarginate.

Brachypterous form: Pronotum longer than broad (male, 48:45; female, 55:52), the lobes indistinctly marked off, the basal margin roundly emarginate (more strongly so in male). Hemelytra extending almost to apex of second abdominal segment, obtusely rounded behind, without membrane. Length, 9-12 mm.; width, 1.32-1.68 mm. (at abdomen, 1.32-2.82 mm.).

Macropterous form: Pronotum broader than long (female, 71:58), the posterior lobe arched. Hemelytra somewhat translucent, finely punctulate; membrane extending onto base of last abdominal segment. Length, 12 mm.; width, 2.1 mm.

N. propinquus is the longest of the American Nabids and is easily recognized by its form. It is closely related to the Palaearctic N. lineatus Dahlb. The species was originally described from Wisconsin and has since been recorded from Illinois, Ohio, New York and Ontario. The author has seen specimens from all of these regions and in addition from Iowa, Massachusetts, and Alberta. The abdominal tergites have, as in almost all other species of Nabis, a distinct transverse shiny spot on each side. Macropterous examples are extremely rare, the male perhaps never occurring in this form. The antennal segments, and other portions of the body vary slightly here as in other members of the genus. The segments of the abdomen are usually about one-half as long as broad. This species frequents the edges of marshes and ponds where the reeds and sedges flourish. The writer has taken it in such situations in company with Protenor belfragei Haglund.

Nabis limbatus Dahlbom.

1850. Nabis limbatus Dahlbom, Konig. Vet. Akad. Handl., p. 227.

1872. Nabis limbatus Reuter, Öf. Vet. Akad. Förh., XXIX, pp. 70, 87, pl. VIII, fig. 5.

1908. Reduvolus limbatus Reuter, Mém. Soc. Ent. Belg., XV, p. 107.

1921. Nabis limbatus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 58, fig. 7.

1922. Nabis limbatus Drake, N. Y. St. Coll. For., Tech. Pub. 16, p. 68, fig. 27a.

Similar to N. propinquus but distinctly less elongate, the fuscous markings usually more pronounced, sometimes the three stripes on the abdomen irregularly united to form one broad longitudinal stripe. Head moderately long, only about one-eighth longer than broad. Eyes slightly larger and more prominent than in propinquus, the length of one equal to width of vertex. Ocelli conspicuous. Antennae rather long, segment I distinctly longer than width of head thru eyes (41:32); proportion, 41:71:63:48. Rostrum with segments II and III subequal (35:33), each much shorter than I of segments.

Pronotum with the pattern on anterior lobe more distinct that in propinquus, often in greater part fuscous; posterior lobe finely punctulate. Legs about as in propinquus but less elongate; the anterior femora about 5-1/2 times as long as thick. Connexivum horizontal. Male slenderer than female, the sides almost parallel; the clasper (seen from above) bowed or cupped outward from body (Plate II, fig. 5). Female with abdomen widened at the middle, the apex pointed, but shorter and more obtusely so than in propinquus.

Brachypterous form: Pronotum with the sides slightly constricted, thus delimiting the lobes, slightly broader than long (male, 46:45; female, 48:46), the basal margin rather truncate or broadly emarginate. Hemelytra translucent, indistinctly finely punctulate, extending onto second abdominal tergite, broadly obtusely rounded or truncate apically, with only faint evidence of membrane. Length, 7.62-9 mm.; width, 1.2-1.5 mm. (at abdomen, 1.6-3 mm.).

Macropterous form: Pronotum broader than long (male, 59:50; female, 65:53), the anterior lobe sometimes almost entirely black, the posterior lobe arched, truncate behind. Hemelytra extending to tip of abdomen, the coriaceous part finely punctulate, sometimes infuscate; membrane with the usual three elongate cells. Length, 8.4-9 mm.; width, 1.68-1.98 mm.

N. limbatus is an European species and was first definitely recorded from America by Reuter who examined specimens from Colorado and Canada. The Colorado records however undoubtedly pertain to the following very closely related species. The writer has seen specimens of limbatus from Alberta, Maine, New York, and Minnesota. These differ in no appreciable way from numerous European examples at hand. The macropterous form is quite rare, the male not having heretofore been known to occur with developed wings. The Minnesota specimens before me(all females)have thicker anterior femora than do the eastern specimens, in this respect agreeing very well with the following species. Also it is to be noted that the antennae and other characters in which measurements are given in the description above are subject to slight variations. The abdominal segments, excepting the last, are scarcely more than a fourth as long as broad. The species inhabits vegetation in and around bogs and marshes.

Nabis nigro-vittatus Sahlberg.

1878. Nabis nigro-vittatus J. Sahlberg, K. Sr. Vet. Akad. Handl., XVI, pp. 36, 162.

1908. Reduviolus nigro-vittatus Reuter, Mém. Soc. Ent. Belg., p. 106.

Form, size, and color very similar to N. limbatus, head slightly narrower, the eyes smaller. Antennae with segment I distinctly longer than width of head thru eyes (40:31); formula, 40:66:55:37. Rostrum with segments II and III subequal (31:31). Pronotum finely punctulate on the posterior lobe. Anterior femora slightly more incrassate than in limbatus, scarcely more than four times as long as thick. Male with prominent genital segments, the clasper as viewed from above straight, produced forward in one plane, not bowed or cupped outward at the middle as in limbatus (Plate II, fig. 3).

Brachypterous form: Pronotum as broad as long (male, 45:45; female, 50:50), constricted as in limbatus. Hemelytra translucent, extending to middle of third abdominal segment, rather sharply rounded apically, the membrane very short, pointed. Length, 7.38-8.6 mm.; width, 1.32-1.5 mm. (at abdomen, 1.8-2.8 mm.).

N. nigro-vittatus, a Siberian species, has heretofore not been recognized as occurring in the United States. The above description is taken from a series of specimens from Pingree Park and Estes Park, Colorado. These agree in all essentials with European specimens before me, tho

the first antennal segment is slightly shorter. The color markings, as in limbatus, vary in their degree of prominence but most often are distinctly darker than in that species. The records of N. limbatus from Colorado undoubtedly pertain to this species as it has until now been labelled under that name in collections. The macropterous form (unknown to me) is said to have the membrane extending beyond the apex of the abdomen. The median line on the abdomen and a sub-basal one on the connexivum are sometimes more or less crimson. The head is in none of the specimens before me "hinter den Augen sehr deutlich langer als der des R. limbatus" as Reuter has dscribed it.

Nabis gerhardi n. sp.

Body short, broad, opaque, pilose; testaceous, marked with fuscous to black. Head with the tylus, a broad stripe on the vertex (widened anteriorly), and the sides behind the eyes brownish fuscous, its under surface black. Pronotum with anterior lobe and the sides in greater part brown, the cicatrices and a median line fuscous; the posterior lobe with humeri and five obsolete lines on the disc brown. Scutellum black with a yellowish callosity on either side. Hemelytra obsoletely mottled or speckled with brown, darker apically. Connexivum pale testaceous, the basal halves of the segments dark brown to fuscous. Meso- and metasternum dull black. Venter brown, paler distally. Antennae, rostrum, and legs brownish testaceous, the latter spotted with brown.

Head short, broader than long, slightly obliquely narrowed behind the eyes. Eyes moderately large, the length of one distinctly less than width of vertex. Ocelli raised, very prominent. Antennae short, segment I less than half the width of head thru eyes (16:33); proportion of segments, 16:28:25:24. Rostrum with segments II and III subequal, each slightly longer than I of antennae (21:16). Pronotum broader than long (62:50). Hemelytra moderately thickly clothed with short, semi-erect brownish hairs; membrane hyaline, extending beyond apex of abdomen. Legs short, rather thickly pilose; the anterior femora incrassate, only about 3 times as long (measured beneath) as deep. Intermediate femora armed beneath with numerous short, piceous spinules. Venter thickly clothed with fine, silvery hairs. Genital segment short; the clasper with a broad semi-circular blade (Plate 1, fig. 10). Length, 5.8 mm.; width, 1.85 mm. (at abdomen, 2.25 mm).

Holotype, macropterous male, Tepehuanes, Mexico, 1909, H. F. Wickham, collector, in author's collection. This distinct little species is the most robust of our members of the genus, and is readily separated from all others by the short antennae, maculate connexivum, and robust form. The tibiae are faintly dotted with brown, the anterior pair being rather distinctly curved inward. The holotype is the specimen listed by Professor Blatchley (Heteroptera Eastern North America, p. 594) as Nabis crassipes Reuter (= N. dentipes, new name). The femora however lack the armature character-

istic of N. dentipes and its more closely related species. It is my pleasure to name the species in honor of Mr. Wm. J. Gerhard who so kindly sent it to me for study.

Nabis flavomarginatus Scholtz.

1846. Nabis flavomarginatus Scholtz, Arb. Schles. Ges. Vat. Kultur., p. 114.

1850. Nabis dorsatus Dahlbom, Konig. Vet. Akad. Handl., 1850, p. 227.

1852. Nabis nervosus Boheman, Öf. Vet. Akad. Förh., IX, p. 77.

1856. Nabis thesigus Kolenati, Melet. Ent., IV, p. 258.

1861. Nabis flavomarginatus Fieber, Europ. Hemip.,p. 161.

1872. Nabis flavomarginatus Reuter, Öf. Vet. Akad. Förh., XXIX, pp. 71, 78, Pl. 8, fig. 7.

1908. Reduviolus flavomarginatus Reuter, Mém. Soc. Ent. Belg.,XV, p. 111.

1921. Nabis flavomarginatus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 8.

Oblong to oblong-ovate, pilose; pale testaceous, a median stripe above and the sides of head, three broad stripes on anterior lobe of pronotum and a median stripe on posterior lobe, the abdomen above (except for a median line) and meso- and metasternum black. The cicatrices on anterior lobe of pronotum, two somewhat obsolete lines on posterior lobe, a broad stripe on either side and a narrow median line on venter, and numerous maculae on legs brownish fuscous to black. Head equally as broad as long, the transverse depressed line on vertex somewhat prominent; postocular part rather short, distinctly narrowed backwards.

Eyes large, prominent, the length of one slightly greater than width of vertex (17:16). Ocelli distinct, equally as distant from the eyes as from each other. Antennae moderately long, segment I slightly longer than width of head thru eyes (42:40); proportion of segments, 42:70:58:48. Rostrum with segments II and III subequal, each about equally as long as I of antennae.

Pronotum with a long collar; the posterior lobe finely punctulate. Scutellum with a distinct semicircular shiny spot in each basal angle and with a raised yellowish callosity on either side. Hemelytra finely punctulate, sparsely clothed with fine short hairs. Legs moderately long; anterior femora thickest near the base, about $3\frac{1}{2}$ times as long as deep (77:22); intermediate femora armed beneath with minute, piceous spinules. Abdomen above and beneath thickly clothed with silvery, sericeous hairs. Male narrower and more elongate than female, with prominent genital segment; the clasper with short rectangular stem and blade, the blade with a distinct spur on its upper edge near the base (Plate II, fig. 2).

Brachypterous form: Pronotum broader than long (male, 60:53; female, 63:56), the anterior lobe rather highly arched, the collar sharply marked off. Hemelytra obliquely narrowed backwards, extending to about the base of the fifth abdominal segment, the membrane narrow. Length, 7.8-9 mm.; width, 1.75-1.92 mm. (at abdomen, 2.28-3.3 mm.).

Macropterous form: Pronotum much broader than long (75:58). Scutellum larger, the basal shiny spots less conspicuous, the base more arched. Hemelytra somewhat speckled with fuscous, the veins paler, prominent; membrane extending beyond apex of abdomen. Length, 9.3 mm.; width, 2.32 mm. (at abdomen, 3.3 mm.).

Flavomarginatus is a Palearctic species common in the northern part of Europe. It is remarkable for its pterygopolymorphism, Reuter having distinguished at least six distinct forms based on wing development. The species varies somewhat in color, the fuscous or black margins often being very pronounced; also the antennae vary considerable in length. Two winged examples (from Europe) before me have the antennal formula, 36:60:56:35, while all other specimens (apterous), from America and Europe, show very little variation. The hemelytra are without the usual three brown spots so common to our other members of the subgenus Nabis. The author feels that this and the following species, N. vanduzeei Kirk., may prove to be more closely related to N. subcoleoptratus Kirby (subgenus Nabicula) than to the members of the subgenus Nabis. The winged male is unknown to me. Specimens have been examined from Kussiloff, Alaska (July, 1898, W. H. Evans), Slave Lake, Alberta (Aug. 17, 1924, O. Bryant) and from numerous European localities. The Colorado records in the literature refer to the following species.

Nabis vanduzeei (Kirkaldy)

1901. Reduviolus vanduzeei Kirkaldy, Wien. Ent. Zeit., XX, p. 223.

1908. Reduviolus flavomarginatus vanduzeei Reuter, Mém. Soc. Ent. Belg., XV, p. 111.

1926. Nabis vanduzeei Harris, Ent. News, XXXVII, p. 287.

Similar to N. flavomarginatus but slightly shorter, more ovate; paler in color, the markings on head and pronotum brown to brownish fuscous, never black; the clasper differently constructed.

Head equally as long as broad, the post-ocular part slightly longer and more obliquely narrowed than in flavomarginatus. Antennae with segment I slightly less than width of head thru eyes (37:40); proportional lengths of segments, 37:70:60:40. Rostrum with segments II and III subequal, each equally as long as I of antennae. Legs moderately long, the anterior pair about 4 times as long as thick. Venter broader than in flavomarginatus. Male clasper slightly shorter and broader than in that species, the stem without the backward projecting spur near its base (Plate II, fig. 7).

Brachypterous form: Pronotum slightly broader than long (male, 55:53; female, 60:57), the collar slightly shorter and less sharply marked off than in flavomarginatus. Hemelytra extending only to about middle of third abdominal segment. Length, 7.68-8.5 mm.; width, 1.62-1.86 mm. (at abdomen, 2.58-3.4 mm.).

Macropterous form: Color in greater part pale yellowish testaceous. Pronotum much broader than long (female, 77:58). Hemelytra narrowed from before the middle as in flavomarginatus and without the usual three discal brownish spots; membrane extending beyond apex of abdomen. Length, 9.3 mm.; width, 2.22 mm. (at abdomen, 3.48 mm.).

This form, altho closely related to the preceding, should be, as previously pointed out by the writer, accorded specific rank. It is known only from Colorado and Montana. Kirkaldy's type, a brachypterous female, is before me. The male is not known to occur in the macropterous form.

Nabis lovetti Harris.

1925. Nabis lovetti Harris, Ent. News, XXXVI, p. 205.

Oblong-ovate, opaque, pilose and sparsely pubescent; yellowish brown, marked with fuscous. A median stripe on head and anterior lobe of pronotum, and meso- and metasternum black. Lateral and ventral stripes on head, markings on anterior lobe of pronotum, seven (sometimes obsoletely developed) stripes on posterior lobe of pronotum, disc of scutellum, three discal spots on each hemelytron, abdomen above in greater part, lateral stripe on either side of body, median stripe of venter, maculae of legs, and apex of second antennal segment brown to fuscous.

Head slightly longer than broad, the postocular part short, slightly narrowed behind. Eyes only moderately large, the length of one slightly less than width of vertex.

Ocelli prominent, placed closer to eyes than to each other. Antennae rather short, the apical segments fuscous, segment I less than width of head thru eyes (28:34); proportional lengths of segments, 28:43:39:35. Rostrum darkened distally, segments II and III subequal in length, each slightly longer than antennal I.

Pronotum with rather wide collar, sparsely pubescent. Scutellum depressed on the disc, the lateral margins yellowish. Hemelytra opaque, rather thickly and evenly clothed with short golden pubescence. Legs moderately short, spotted with fuscous to brown; the anterior femora clothed beneath with numerous short hairs and minute piceous spinules, about $3\frac{1}{2}$ times as long as thick; intermediate femora clothed as anterior. Male with long genital segment, the clasper slender and lance-like. (Plate I, fig. 12).

Brachypterous form: Pronotum broader than long (63:53), the anterior lobe arched. Hemelytra narrowed posteriorly; membrane well developed, extending to middle of genital segment, veins distinct. Length, 7-7.5 mm; width, 1.92 mm. (at abdomen, 2.58 mm.).

Macropterous form: Pronotum much broader than long (female, 75:57). Hemelytra entire; the membrane extending well beyond apex of abdomen, with three elongate, closed, discal cells. Length, 8.82 mm.; width, 2.28 mm. (at abdomen, 2.88 mm.).

This remarkably distinct species is to be separated from all other American Nabids by the yellowish to reddish brown color, which has somewhat of an orange to roseous

tinge, by the nature of the pubescence of the hemelytra, and especially by the linear, lance-like clasper of the male. It was described from California and Oregon and is known only from the type localities.

Nabis roseipennis Reuter.

1872. Nabis roseipennis Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 89, Pl. VIII, fig. 10.

1872. Nabis punctipes Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 89, Pl. VIII, fig. 11.

1873. Coriscus roseipennis Stål, Enum. Hemip., III, p. 113.

1873. Coriscus punctipes Stål, Enum. Hemip., III, p. 113.

1890. Nabis roseipennis Reuter, Rev. d'Ent., IX, p. 308.

1908. Reduviolus roseipennis Reuter, Mém. Soc. Ent. Belg., XV, p. 118.

1921. Nabis roseipennis Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 11.

1922. Nabis roseipennis Mundinger, N. Y. State Coll. For., Tech. Publ. 16, pp. 151-160, figs. 22, 29, 32.

Oblong, opaque, thinly pilose; yellowish to brownish testaceous, thickly marked with brownish fuscous to black. Head with median line above, lateral stripes, and lower surface dull black. A median line on anterior lobe of pronotum, scutellum in greater part, a broad stripe on each side of body, meso- and metasternum, and median line of venter dark brown to black.

Head distinctly longer than broad. Eyes prominent, the length of one subequal to width of vertex. Ocelli conspicuous, slightly closer to each other than to the eyes. Antennae testaceous, an apical ring on segment II and all

of III and IV fuscous to black; segment I subequal to (brachypterous, 31:31) or longer (macropterous, 38:31) than width of head thru eyes. Rostrum with segment II and III subequal, each equal to or slightly shorter than antennal I. Pronotum sparsely pubescent, the cicatrices of anterior lobe brown. Scutellum depressed on disc, the lateral callosities (often extending to apex) yellowish. Hemelytra sparsely pubescent, thickly speckled or spotted with brown or fuscous, the veins paler, raised, prominent. Legs spotted with fuscous to brown, the spots on sides of anterior and intermediate femora tending to a transverse striping; tibiae dotted with brown; anterior femora about 4 (brachypterous) to 4-2/3 (macropterous) times as long as deep. Male with long genital segment which has an outward projecting flange or flap upon which the blade of the clasper rests; the clasper with long somewhat sinuate stem. (Plate II, fig. 6).

Brachypterous form: Antennal formula, 31:48:48:38. Pronotum broader than long (male, 48:43; female, 55:47), the posterior lobe not more strongly arched than anterior. Hemelytra extending to tip of abdomen; the membrane narrow, with closed discal cells. Anterior femora slightly shorter and more incrassate than in macropterous form. Length, 6.6-7.6 mm.; width, 1.44-1.68 mm. (at abdomen, 2.11-2.6 mm.).

Macropterous form: Antennal formula; 38:64:63:47. Pronotum much broader than long (male, 60:47; female, 65:52), the posterior lobe much higher than anterior lobe. Hemelytra

entire, extending well beyond apex of abdomen. Length, 8.4-9.2 mm.; width, 1.68-2 mm. (at abdomen, 2-2.6 mm.).

Roseipennis is one of the more common and better known Nabids. It is at once distinguishable from all of our other members of the genus by the sinuate stem of the clasper and the projecting flange on each side of the genital segment of the male, the larger size, darker brown color, and the dotted tibiae. The brachypterous form is the more common one in higher altitudes and more northern regions while further south only macropterous individuals seems to occur. The color is somewhat variable, occasionally in short-winged specimens tending to a yellowish testaceous with a roseous tinge. The connexivum is often marked with crimson. The species was originally described from Wisconsin and New Jersey. The author has examined specimens from the following localities: Ontario, Quebec, New York, Massachusetts, New Jersey, Pennsylvania, Ohio, West Virginia, Virginia, North Carolina, Tennessee, Alabama, Florida, Mississippi, Missouri, Illinois, Indiana, Michigan, Wisconsin, Iowa, Minnesota, Nebraska, Kansas, Colorado, Alberta, and British Columbia.

Biology: Mundinger (1922) has published a rather complete study of the life and habits of N. roseipennis. At Ames the duration of the various stages is considerably shorter than that recorded by Mundinger for them in New York. The species hibernates in the adult stage. Eggs are deposited in the stems of plants and the life habits

are quite similar to those of other members of the genus. The adults seem to prefer more shady situations than does N. ferus Linn., tho they are common in grassy meadows and along the margins of woods. The writer has observed no indication of a tendency for a gravid female to return to a previously selected spot for oviposition as is stated by Mundinger.

Nabis rufusculus Reuter.

1872. Nabis rufusculus Reuter, Öf. Vet. Akad. Förh., XXIX, p. 92.

1873. Coriscus rufusculus Stål, Enum. Hemip., III, p. 113.

1878. Coriscus assimilis Uhler, Proc. Bost. Soc. Nat. Hist., XIX, p. 422.

1901. Reduviolus cherokeanus Kirkaldy, Wien. Ent. Zeit., XX, p. 224.

1908. Reduviolus rufusculus Reuter, Mém. Soc. Ent. Belg., XV, p. 119.

1921. Nabis rufusculus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 58, fig. 12.

1922. Nabis rufusculus Mundinger, N. Y. St. Coll. For., Tech. Pub. 16, p. 149, pls. 12-19.

Similar to roseipennis but slightly smaller, the color distinctly paler, the markings most often brownish, sometimes with a crimson tinge, rarely black; the first antennal segment slenderer, the eyes slightly smaller, the posterior tibiae usually immaculate, and the clasper of the male with short stem and very broad semicircular blade.

Head longer than broad. Eyes prominent, slightly smaller than in roseipennis. Antennae with segment I longer than width of head thru eyes (34:29); proportion of segments,

34:53:50:37. Rostrum with segments II and III subequal to each other and to I of antennae. Pronotum with the median line crimson to brownish, the cicatrices of anterior lobe and the lateral lines of posterior lobe usually only slightly darkened. Scutellum in greater part pale testaceous, the median line crimson to fuscous. Hemelytra usually distinctly less maculate and splotched with brown than in roseipennis Legs feebly spotted with fuscous, the posterior tibiae usually immaculate; anterior femora 4 times as long as deep. Male smaller and less ovate than female, the clasper with short stem and broad semicircular blade (Plate II, fig. 8).

Brachypterous form: Pronotum broader than long (male, 42:38; female, 52:49); the anterior lobe rather strongly arched, the collar well marked off. Hemelytra somewhat arched; the membrane extending scarcely to to slightly beyond tip of abdomen, usually without closed cells. Length, 6.4-6.9 mm.; width, 1.3-1.6 mm. (at abdomen, 1.8-2.6 mm.).

Macropterous form: Color usually darker, more brownish than in brachypterous. Pronotum broader than long (52:49); the posterior lobe much higher than anterior lobe. Hemelytra extending well beyond apex of abdomen; the veins distinct, forming the usually elongate closed cells. Length, 7.2 mm.; width, 1.5 mm. (at abdomen, 2.3 mm.).

This species usually is easily recognized by its pale, reddish yellow color. At times however, the brachyp-

terous females are extremely difficult to separate from those of N. roseipennis. The posterior tibiae, usually immaculate, may at times have a row of fine fuscous dots, from each of which a strong seta arises. Only one specimen of those that I have examined has had closed cells in the membrane of the brachypterous form. This one, a female from Oregon, is fully as large as the brachypterous roseipennis. One specimen before me has the left hemelytron reaching almost to the apex of the abdomen while the right extends not much beyond the middle of the abdomen. Rufusculus was described from a short-winged female from Wisconsin. Specimens are before me or have been examined by me from the following states: Ontario, Maine, Massachusetts, New York, Pennsylvania, West Virginia, North Carolina, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, North Dakota, Idaho, Oregon, Washington, British Columbia, and Alberta. The species is also recorded from Maryland, District of Columbia, Virginia and Colorado. The type of Nabis cherokeanus Kirkaldy, a macropterous male from North Carolina, is before me. It undoubtedly is referable to N. rufusculus but has slightly smaller legs and narrower clasper. The life stages and habits are very similar to those of N. roseipennis.

Nabis kalmii Reuter.

1872. Nabis kalmii Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 91, Pl. VIII, fig. 15.

1873. Coriscus kalmii Stål, Enum. Hemip., III, p. 113.

1901. Reduviolus kalmii Kirkaldy, Wien. Ent. Zeit., XX, p. 225.

Similar to N. rufusculus from which it differs in its more testaceous color, slenderer and straighter first antennal segment, slightly narrower head, and narrower clasper of male (Plate II, fig. 9). Length, 6.3-7.3 mm.; width, 1.3-1.65 mm. (at abdomen, 1.6-2.1 mm.).

This little understood species is extremely closely related to N. rufusculus Reuter, differing from that form only in the characters pointed out above. It is more southern in distribution and only the macropterous form is known to occur. Specimens are at hand from Wisconsin, Illinois, Ohio, District of Columbia, Virginia, Alabama, Missouri, Iowa, and Kansas. It is listed in the literature as also occurring in Nebraska and Colorado. A male specimen determined by Reuter is before me. In the opinion of the author N. kalmii may prove upon further study to be no more than macropterous form of N. rufusculus. Unfortunately the only long-winged male of this latter species before me is Kirkaldy's type of N. cherokeanus and that as is pointed out above has the clasper slightly narrower than the brachypterous form. Further evidence is the fact that in some other species a difference in the development of the ocelli (N. spinicrus), the length of antennal segments (N. roseipennis), the size of eyes, claspers, and other structures (N. ferus), as well as other differences accompany the varying degrees of wing development.

Nabis capsiformis Germar.

1837. Nabis capsiformis Germar, Silberm Revue Ent., V, p. 132.

1837. Nabis angusta Spinola, Essai sur les Hémip., p. 107.

1848. Nabis longipennis Costa, Atti. Inst. Natl. for Napol. for 1848, p. 750.

1855. Nabis caffra Stål, Öf. Vet. Akad. Förh., XII, p. 39.

1870. Nabis elongatus Meyer-Dur, Mitth. Schweiz. Ent. Ges., III, p. 178.

1872. Nabis capsiformis Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 88, Pl. VIII, fig. 9.

1872. Nabis kinbergi Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 90.

1878. Nabis saundersi White, Ent. Mo. Mag., XV, p. 159.

1896. Nabis brullei Lethierry and Severin, Cat. Gén. Hémip., III, p. 208.

1908. Reduviolus capsiformis Reuter, Mém. Soc. Ent. Belg., XV, p. 114.

1921. Nabis capsiformis Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 9.

Elongate, narrow, smooth, somewhat shiny; thinly pubescent and also pilose; pale whitish-to yellowish-testaceous, a median line and two postocular spots on head, median line on pronotum, with pronotal cicatrices, disc of scutellum, lateral stripes on body, meso- and metasternum in greater part, and median line of venter nigrofuscous. Head longer than broad, the postocular part rather long and parallel sided. Eyes rather prominent, the length of one faintly more than width of vertex. Ocelli conspicuous, placed closer to each other than to the eyes. Antennae moderately long, segment I rather slender, straight, scarce-

ly thickened distally, its length distinctly greater than width of head thru eyes (35:25); II with the usual dark annulus at apex; proportion of segments, 35:58:55:35. Rostrum with segments II and III subequal in length, each distinctly shorter than antennal I.

Pronotum as broad as long or distinctly broader than long; the anterior margin of collar and three obsolete stripes on posterior lobe sometimes brownish fuscous. Scutellum with lateral margins yellowish. Hemelytra sub-hyaline, somewhat shiny, clothed with a few scattered, short, fine hairs; membrane extending beyond apex of abdomen, with three elongate discal cells. Legs moderately long, concolorous with body, usually immaculate; the anterior femora from 5 to 7 times as long as thick. Male smaller and more slender than female, the clasper with a short, narrow semi-circular blade (Plate II, fig. 4). Length, 6.9-9.9 mm.; width, 1.32-1.5 mm. (at abdomen, 1.5-1.8 mm.).

Nabis capsiformis is a cosmopolitan species occurring in this country from North Carolina to Texas and southward into South America. The true brachypterous form is not known to occur altho the hemelytra vary in development.
A male before me from Pascagoula, Mississippi, has the membrane reaching scarcely beyond the tip of the abdomen while in others at hand it reaches more than half its length beyond the abdomen. The pronotum in this shorter winged form has the anterior lobe almost as highly arched as the posterior. The anterior and intermediate femora often show

obsolete indications of the spotting and striping common in other species of the genus. The abdomen is brownish above, with the margins paler. The outer cells of the membrane are often unclosed. The antennae are somewhat variable in length and the claspers of the males show a slight variation in shape. Specimens have been examined from North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Texas, Mexico, Cuba, San Domingo, Trinidad, and South America. The species is said to frequent tall grasses in swampy meadows.

Nabis alternatus Parshley.

1922. Nabis alternatus Parshley, S. D. St. Coll., Tech. Bul. 2, p. 12, fig. 1.

Narrow, somewhat elongate, thinly pilose; grayish testaceous, marked with brownish fuscous to black. Head with median line above and two lateral stripes blackish. Pronotum with cicatrices, median and two lateral lines on anterior lobe blackish; posterior lobe with humeri and five longitudinal stripes on disc brown (the median stripe broader and darker than others). Scutellum dull black, with a yellowish callosity on each side. Hemelytra somewhat shiny, grayish testaceous, rather thickly dotted with fuscous brown. Abdomen above black, the connexivum pale with a conspicuous black spot occupying the basal half of each segment. Thorax beneath largely black. Venter with narrow median and broad lateral stripes brown to black. Antennae testaceous to fuscous, the apex of segment II and all of III and IV darker. Femora distinctly spotted with fuscous to black; the

intermediate and posterior tibiae faintly dotted.

Head distinctly longer than broad; the postocular part rather long, parallel-sided. Eyes moderately prominent, the length of one equal to width of vertex. Ocelli conspicuous, placed closer to each other than to the eyes. Antennae moderately long, segment I slightly thickened distally, its length sub-equal to width of head thru eyes (27:28); proportion of segments, 27:50:44:25. Scutellum depressed on disc. Anterior femora about $4\frac{1}{2}$ to 5 times as long as thick. Male clasper rather narrow, the diameter of its blade distinctly less than width of an eye viewed from above (Plate II, fig. 11).

Brachypterous form: Pronotum slightly broader than long (male, 46:40; female, 53:45), the anterior lobe scarcely (female) or equally as highly arched as posterior lobe. Hemelytra narrowed from middle outward; membrane well developed, narrow, extending slightly beyond apex of abdomen, with distinct closed cells. Wings extending to about middle of abdomen. Length, 6.9-7.3 mm.; width, 1.38-1.56 mm. (at abdomen, 1.68-2.1 mm.).

Macropterous form: Pronotum broader than long (male, 50:45; female, 56:50), the posterior lobe much higher than anterior. Hemelytra well developed, scarcely or completely covering the abdomen; the membrane broad, extending well beyond tip of abdomen. Length, 7.5-8.1 mm.; width, 1.56-1.7 mm. (at abdomen, 1.7-1.9 mm.).

This distinct little species is quite variable in color markings. The short winged form seems to be more common in the higher altitudes and often in this form, and even in some macropterous examples, the spots of the hemelytra and femora are so numerous that they run together giving a mottled black appearance. In these the abdomen is shiny black above and the connexivum strongly alternated with black. In other examples the hemelytra are very sparsely dotted, the abdomen brownish above, and the connexivum pale thruout. This pale form may be known as variety uniformis, n. var. N. alternatus was described originally from South Dakota and British Columbia. Specimens from the type localities are before me and in addition numerous examples from the following localities, Washington, Oregon, California, Nevada, Utah, Idaho, Montana, Wyoming, North Dakota, Iowa, Nebraska, Kansas, Colorado, New Mexico, Texas, and Mexico. The species has often been confused in collections with Nabis ferus Linn., and is the form that has usually been recorded from America as N. ferus var. punctatus Costa. There seems however to be no good reason for suspecting it to be the true punctatus and it should undoubtedly be accorded specific rank.

Nabis alternatus var. uniformis n. var.

Form and size similar to typical alternatus; differing however in its paler color, less distinctly spotted hemelytra, pale to brownish abdomen, and uniformly pale

connexivum.

Holotype, macropterous male, Fresno, California, June 20, 1926, C. J. Drake, collector, and allotype, macropterous female, Corvallis, Oregon, June 26, 1926, C. J. Drake, collector, in author's collection. Specimens are before me from California, Oregon, British Columbia, South Dakota, Colorado, New Mexico, and Texas.

Nabis ferus (Linnaeus).

1758. Cimex ferus Linnaeus, Syst. Nat., edn. 10, I, p. 449.

1761. Cimex ferus Linnaeus, Fauna Suec., edn. 2, pp. 256, 962.

1775. Cimex ferus Fabricius, Syst. Ent., p. 726.

1794. Miris ferus Fabricius, Ent. Syst., IV, p. 185.

1794. Miris vagans Fabricius, Ent. Syst., IV, p. 185.

1861. Nabis ferus Fieber, Europ. Hemip., p. 161.

1872. Nabis ferus Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 72.

1914. Coriscus ferus, Garman and Jewett, Ky. Agr. Exp. Sta., Bul. 187, pp. 585-587, figs. 12, 13, 14.

1918. Reduviolus ferus Osborn, Jl. Agr. Res., XX, pp. 194-197, figs. a-f.

1921. Nabis ferus Hickman, Bul. Brookl. Ent. Soc., XVI, p. 59, fig. 10.

Similar to N. alternatus var. uniformis but larger, more grayish testaceous, usually less distinctly spotted with fuscous and with much larger clasper.

Head longer than broad. Antennae with segment I subequal to width of head thru eyes (26:28); the segments in proportion, 26:48:47:25. Rostrum with segments II and

III subequal, each slightly longer than antennal I (30:26). Pronotum broader than long. Anterior femora about 3½ times as long as deep. Male clasper with moderately broad blade. (Plate II, fig. 12).

Brachypterous form: Pronotum broader than long (55:50). Hemelytra narrowed distally, reaching scarcely to or well beyond apex of abdomen. Length, 7.2-9 mm.; width, 1.5-1.8 mm. (at abdomen, 1.9-2.1 mm.).

Nabis ferus Linnaeus, a Palaearctic species has become common thruout southern Canada and the northern half of the United States from coast to coast. It is quite variable in size, in the amount of fuscous markings, in the length of the antennal segments, and to some extent in the shape of the clasper of the male. Specimens taken in early spring (over-wintered examples) and specimens from higher localities are almost invariably darker and more distinctly and thickly marked with fuscous than others. More than a thousand examples have been examined from the following localities, Quebec, Maine, New York, Connecticut, Pennsylvania, Ohio, Indiana, Michigan, Wisconsin, Illinois, Tennessee, Mississippi, Missouri, Iowa, Minnesota, North Dakota, Nebraska, Kansas, Colorado, Montana, Alberta, British Columbia, Washington, Oregon, California, and Arizona.

Biology: Several workers have published observations on the life and habits of this common nabid. The author has followed the complete life cycle as it occurs

in the vicinity of Ames, Iowa. The insect hibernates in the adult stage. Eggs, as in all other nabids, are deposited in the stems of grasses. They hatch in about eight days. The nymphs undergo five moults, the first four instars requiring an average of three days each while the last instar requires about six days. The species prefers more sunny and drier situations than does most of the other common species of the genus. The younger nymphs wander about on the ground where their color and shape blends remarkably well with the dead and dying grass blades and seeds. The older nymphs venture to climb the higher grass stems but upon the least disturbance they loosen their hold and fall to the bases of the plant. The adults often invade the fields and gardens where they prey upon aphids, leaf-hoppers, and caterpillars.

Nabis ferus var. pallidipennis n. var.

Usually smaller and slenderer than typical ferus, the color more of a pale yellowish testaceous; hemelytra somewhat translucent, immaculate except for three prominent brown spots on outer vein of corium. Abdomen above pale yellowish to brownish. Eyes usually less prominently rounded than in typical ferus. Antennae longer than in typical form, segment I longer than width of head thru eyes (31:27); proportion of segments, 31:55:56:35. Pronotum equally as broad as long (42:42), gradually widened backwards, the sides almost straight. Hemelytra narrowed posteriorly,

extending to or beyond tip of abdomen, cells of membrane often unclosed. Male with clasper as in typical form. Macropterous form with slightly larger eyes, otherwise, except for wing development as in brachypterous form. Length, 6.7-8.5 mm.; width, 1.3-1.7 mm. (at abdomen, 1.5-2.1 mm.).

Holotype, brachypterous male, allotype, brachypterous female, and morphotype, macropterous male, all taken at Cedar Falls, Iowa, July 17, 1926, H. M. Harris, collector. Paratypes, many males and females taken with the types. This form may, when only a few examples are at hand, appear sufficiently distinct to be accorded specific rank. However, with a long series for study it is evident that the differential characters are quite variable. It seems to be no more than a form of our very variable N. ferus that is characteristic of drier and warmer situations. The entire type series was taken on a typical high Iowa prairie. In addition to them specimens from New York, Pennsylvania, Ohio, and Minnesota are at hand. Some of these closely approach N. capsiformis in appearance.

Nabis inscriptus (Kirby.).

1837. Reduviolus inscriptus Kirby, Richardson's Fauna Bor. Amer., IV, p. 280, pl. 6, fig. 7.

Similar to N. ferus Linn. from which it differs in its shorter antennae, larger eyes, more incrassate anterior femora, and differently formed clasper of the male.

Oblong-ovate, yellowish to grayish testaceous, marked with fuscous to black as in related species. Head longer than broad. Eyes rather prominent, the length of one slightly greater than width of vertex. Antennae only moderately long, length of segment I distinctly less than width of head thru eyes; the proportion of segments, 24:37:37:25. Rostrum with segment II and III subequal, each slightly longer than antennal I. Pronotum slightly broader than long. Hemelytra clothed above with short, semierect, rather rigid, yellowish brown hairs; the costal margin broadly rounded; membrane narrow, extending about to apex of abdomen, with the usual closed cells. Male clasper with the blade not so broadly rounded as in ferus. Anterior femora about 3 times as long as thick. Length, 6.2 mm.; width, 1.38-1.5 mm. (at abdomen, 2-2.3 mm.). (Plate II, fig. 10).

Nabis inscriptus, described from a brachypterous female said to have been taken in latitude 65° Boreal America, has long puzzled students of Hemiptera. Reuter in 1908 (Mém. Soc. Ent. Belg., XV, p. 120) and again in 1913 (Öfver. Finska Vet. Soc. Förh., LV, No. 14, p. 82) published descriptions of what he took to be this species, basing his studies on specimens from Colorado. He identified the N. boreelus Reuter, which is said to have a wide distribution in the northern palaearctic regions, as only a color variety of inscriptus. The present author has had the good fortune of

being able to study a male specimen from Colorado determined by Dr. Reuter. It is a brachypterous specimen bearing the labels, Colorado, 2158, C. F. Baker collection, and undoubtedly is the one upon which Reuter based his determination of N. inscriptus as his specimens bore the same label. (He had three specimens from Colorado, only one of which was a male). This specimen however is no more than a short-winged N. ferus Linn., perhaps a little dark in color, yet in no way different from others, both brachypterous and macropterous males and females, before me. The darker color would be expected of a form inhabiting the higher altitudes. There is at hand however, a long series of brachypterous males and females of a form that I have elected to call N. inscriptus Kirby. These were taken at Pingree Park and Estes Park, Colorado, 1923-1925, by C. J. Drake. They agree in more exactly representing the form and color as depicted in Kirby's figure, than does the specimen determined by Reuter and also the clasper of the male is constantly different from that of N. ferus. Furthermore, and what seems most convincing, is the fact that the range is such that it may well have been taken in latitude 65° north for there are specimens at hand from Moscow, Idaho, and in Alberta, Canada from Calgary, Edmonston, and Slave Lake, these latter collected by O. Bryant. There is also a specimen at hand, belonging to the Field Museum of Chicago, from Skilah Lake, Alaska, collected September, 1913 by J. Friesser.

This specimen, a male, is peculiar in that it is almost entirely dark testaceous to black thruout. Three specimens from Montreal, Canada, belonging to the British Museum (kindly loaned to me by W. E. China and determined by E. A. Butler as N. inscriptus Kirby, are all brachypterous examples of N. roseipennis Reuter. Also there is in the Kirkaldy collection a specimen of N. alternatus Parshley from California that bears the label, Nabis inscriptus. Many specimens of rufusculus, roseipennis and ferus from the eastern states have been sent to me labelled as N. inscriptus.

Genus METATROPIPHORUS Reuter.

1872. Metatropiphorus Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 93.

1873. Metatropiphorus Stål, Enum. Hemip., III, p. 110.

Elongate, anteriorly narrowed, pubescent. Head constricted at basal margin of eyes, the postocular part somewhat globose. Eyes moderately large, coarsely granular. Ocelli distinct, rather close together, placed behind the base of the eyes. Antennae moderately long; segment I much longer than head, suddenly and evenly thickened along basal third. Rostrum slender, segment II longer than III. Pronotum broader than long, strongly constricted slightly behind the middle; collar narrow, less distinctly marked off than in Nabis; posterior lobe strongly raised, the disc punctate, the basal margin straight. Scutellum opaque, uni-

colorous, the disc slightly depressed, without foveae; the apex truncate, slightly raised. Hemelytra extending well beyond tip of abdomen, the membrane without closed cells. Legs moderately long; anterior femora of almost equal thickness thruout, armed beneath with numerous short piceous spine-like teeth; anterior tibiae short, thick, armed within with piceous spines, without a spongy fossa at apex; intermediate and posterior tibiae unarmed. Anterior acetabula rather strongly produced, extending laterally beyond sides of pronotum and visible from above. Metapleuron opaque, the ostiolar canal shiny, evenly raised, posteriorly directed. (Type, M. belfragii Reuter).

This genus is easily recognized by the elongate, distally swollen first antennal segment, the coarsely granulate eyes, the laterally projecting anterior coxal cavities, the unarmed intermediate tibiae, and the absence of spongy pads at the ends of the anterior and intermediate tibiae. The antenniferous tubercules are rather strongly, obliquely produced forward, so that the head appears widened in front of the eyes. The genus is represented in the United States by a single described species. A second species, occurring in Porto Rico, is here added and a third, occurring in China, is said to belong to this genus.

Key to Species of Metatropiphorus.

Second antennal segment almost two-fifths longer than first; anterior femora about 7 times as long as thick . . . . . belfragii Reut., p. 116.

Second antennal segment scarcely one-fifth longer than first; anterior femora scarcely more than 5 times as long as thick . . . . . .drakei n. sp., p. 118.

Metatropiphorus belfragii Reuter.

1872. Metatropiphorus belfragii Reuter, Öf. Vet. Akad. Förh., XXIX, No. 6, p. 94.

1876. Metatropiphorus belfragii Uhler, Bul. U. S. Geol. Geog. Surv., I, p. 325.

1914. Metatropiphorus belfragii Barber, Bul. Am. Mus. Nat. Hist., XXXIII, p. 502.

1916. Metatropiphorus belfragii Barber, Jour. N. Y. Ent. Soc., XXIV, No. 4, p. 308.

1920. Metatropiphorus belfragii Torre-Bueno, Bul. Brookl. Ent. Soc., XV, p. 70.

Slender, testaceous, with grayish pubescence; the head, antennae, markings on anterior lobe of pronotum, scutellum, body beneath, tarsi, apices of tibiae, and a broad apical annulus at apex of each femur piceo-testaceous. Head distinctly longer than broad. Eyes moderately prominent, the length of one almost twice as great as width of vertex. Antennae moderately long, segment I almost three times as long as the width of head thru eyes (56:20); proportion of segments, 56:76:53:27. Rostrum with segment I equally as broad as long; segment II much longer than III (25:16).

Pronotum slightly broader than long (46:42); the posterior lobe arched, rugosely punctate, the humeri prominent. Scutellum slightly depressed on the disc. Hemelytra pubescent, also with a few fine hairs, rather obsoletely rugulosely punctate, the veins prominent; often with a distinctly paler patch on clavus at apex of scutellum, another at middle of corium, and a third near apex of corium opposite the middle of membrane. Membrane long, the veins fuscous, prominent. Legs in greater part testaceous, the anterior and intermediate femora with piceous spots and bars; anterior femora about 7 times as long as thick (78:11). Venter in greater part piceous black. Male with small, distinctive clasper (Plate III, fig. 6). Length, 6.9-7.2 mm.; width, 1.35-mm. (at abdomen. 1.44 mm.).

The species was described from Texas and has since been recorded from West Indes, Florida, North Carolina, Virginia, District of Columbia, Maryland, New Jersey, New York, and Illinois. Specimens from Mississippi, Connecticut, District of Columbia, Florida, Illinois, and Iowa are before me. The Iowa specimens, eight of them, were taken in the summer of 1927 by Mr. H. G. Johnston and the writer. They were taken singly, never more than one from a locality, and always by beating tall shrubs and trees. Nothing is known of the life cycle of the species.

Metatropiphorus drakei n. sp.

Similar to M. belfragii but smaller, with shorter and paler legs and antennae, and with differently shaped clasper of male.

Head pale testaceous in front of eyes. Antennae with most of segment I and the base of segment II pale; segment I slightly more than two times as long as width of head thru eyes; (40:18); the proportion of segments, 40:46:36: (IV absent). Rostrum with segment II about one-half longer than III (18:13). Pronotum slightly broader than long (37:33), rather thickly clothed with grayish pubescence, the posterior lobe with a shiny median line. Scutellum considerably smaller than in belfragii. Hemelytra extending well beyond apex of abdomen. Legs flavo-testaceous, the markings as in belfragii but more brownish; anterior femora equally as thick as in belfragii but much shorter, scarcely more than five times as long as deep (58:11). Male clasper smaller than in belfragii, triangular (Plate III, fig. 5). Length, 5.7 mm.; width, 1.1 mm.

Described from a male, holotype, Utuado, Porto Rico, April 8, 1900, in author's collection. It is my pleasure to name this species after Dr. Carl J. Drake who is responsible for my interest in the Nabidae and who presented me with the first specimen of the Genus Metatropiphorus that it was ever my privilege to examine.

Genus CARTHASIS Champion.

1900. Carthasis Champion, Biol. Centr. Amer., Heter., II, p. 305.

1901. Orthometrops Uhler, Proc. Ent. Soc. Wash., IV, p. 508.

Small, elongate, somewhat shiny, sparsely pilose. Head exserted, somewhat widened anteriorly to the prominent antenniferous tubercules, with a distinct transverse depression between the eyes. Ocelli absent. Eyes rather prominent, coarsely granulate. Antennae moderately long, segments III and IV much thinner than I and II. Rostrum slender, four-segmented, segment I as broad as long.

Pronotum with anterior lobe sub-cylindrical, the collar wide but not sharply marked off; posterior lobe emarginate at base. Scutellum equilateral, the disc flat, without lateral callosities. Hemelytra strongly constricted before the middle. Anterior acetabula placed far forward, obliquely projecting anteriorly and readily visible from above; closed behind. Anterior femora slightly incrassate, minutely denticulate beneath and also with numerous rigid setiform spines; anterior tibiae shorter than femora, spinose within, provided with a spongy pad at the apex. Intermediate and posterior tibiae unarmed, provided with apical pads as in anterior ones. Tarsi uniarticulate (Type, C. rufonotatus Champion).

The genus Carthasis is easily recognized by the small size, absence of ocelli, elongate anterior coxae, and the peculiar structure of the fore acetabula. It has its nearest ally in our American fauna in the genus Neogorpis Barber. Blatchley in his Heteroptera of Eastern North America (1926, p. 538) has placed the genus with the Reduviidae and erected for it the sub-family Carthasinae. It is my opinion however that that author has not made a sufficiently close study of the related genera (Gorpis Stål, Veronia Buch.-White, and Neogorpis Barber) to be qualified to transpose the group from one family to another. The genus as now known contains seven species two of which are described below as new.

Key to Species of Carthasis.

I. Gula without setiform spines, but with several long fine hairs; hemelytra with numerous erect hairs . . II

Gula with four rigid, setiform spines; hemelytra without erect hairs III

II. Pronotum distinctly longer than broad, with an obsolete darker stripe on each side of the paler median stripe; posterior lobe raised scarcely higher than anterior . . . . . uhleri n. sp. p. 121.

Pronotum slightly broader than long, median portion of anterior lobe and a broad transverse fascia on posterior lobe brownish to fuscous; posterior lobe strongly raised above anterior. . . . . championi n. sp., p. 123.

III. Length of first antennal segment distinctly less than twice the width of head thru eyes. IV

Length of first antennal segment subequal to twice the width of head thru eyes . . . . . VI.

IV. Segment I of antennae one-third longer than the head; pronotum with a median darker stripe or line; form slender. . . . . gracilis Harris, p. 124.

Segment I of antennae and head subequal in length; pronotum with a median paler stripe; form less elongate . . . . . .V.

V. Antennae with segment II distinctly longer than I; pronotum with anterior lobe not strongly arched, posterior lobe scarcely higher than anterior. . . . . .distinctus Harris, p. 126.

Antennae with segment II slightly shorter than I; pronotum with anterior lobe arched, the posterior lobe suddenly and strongly raised, .minor Reuter, p. 127.

VI. Antennal segment II distinctly longer than I; rostral segment II shorter than III and IV conjoined . . . . . decoratus Uhler, p. 128.

Antennal segments I and II subequal; rostral segment II subequal to III and IV conjoined. . . . . .rufonotatus Champ., p. 130.

Carthasis uhleri n. sp.

Elongate, pilose; flavo-testaceous, the head above, antennae, a broad stripe on each side of disc of pronotum, scutellum, inner part of clavus, a transverse fascia on hemelytra at apex of clavus, and membrane (except for a spot opposite apex of corium), darker, brownish testaceous. Head longer than broad, the under surface with several long, fine hairs. Eyes prominent, coarsely granulated, the length of one slightly greater than width of vertex. Antennae long, pilose, segment I about twice as long as the

width of head thru eyes (35:18), thicker than others; proportion of segments, 35:32:29:48. Rostrum with segment II as long as III and IV conjoined.

Pronotum distinctly longer than broad; anterior lobe (median measurement) twice as long as posterior and almost as high. Hemelytra with a prominent crimson patch in the outer apical angle, the veins and costal margin with numerous upright hairs; membrane extending beyond apex of abdomen, its veins indistinct. Anterior femora about eight times as long as thick (47:6). Venter constricted at base, the apex with two extremely long fine hairs arising from the last connexival segment and projecting laterally on each side. Male clasper as in figure (Plate III, fig. 11). Length, 4 mm.; width, .75 mm. (at abdomen, .88 mm.).

Holotype, male, Cacao, Trece Aguas, Alta V. Pas., Guatemala, March 30, Schwarz and Barber, collectors. (Type U. S. National Museum). Paratype, male, Livingston, Guatemala, May 7, H. S. Barber, collector.

This distinct little species differs from all previously described members of the genus in that the spine-like setae of the gula are absent and the body is more hairy. These hairs are particularly conspicuous on the gula, the first and second rostral segments, the anterior coxae and femora, the venter, and the hemelytra, scutellum, and pronotum. The venter is also finely pubescent. The holotype has the darker markings slightly more pronounced

than does the paratype. The markings of the pronotum leaves a median stripe, obliquely widened on posterior lobe, pale.

Carthasis championi n. sp.

Elongate, pilose, also finely pubescent; flavo-testaceous, the head, anterior lobe of pronotum, and a transverse fascia on disc of posterior lobe brownish to fuscous; hemelytra marked as in C. uhleri, the membrane also with an apical pale spot; scutellum with a reddish tinge; mesosternum fuscous brown. Head slightly longer than broad, clothed beneath with several long fine hairs as in C. uhleri. Eyes prominent, the length of each slightly greater than width of vertex. Antennae flavo-testaceous, the terminal segment darker; segment I distinctly less than twice as long as width of head thru eyes (33:20); proportion of segments, 33:30:27:47. Rostrum as in uhleri.

Pronotum slightly broader than long, the anterior lobe (median measurement) scarcely twice as long as posterior; the collar more sharply marked off than in uhleri; the posterior lobe much higher than anterior. Hemelytra clothed as in uhleri, more strongly widened beyond the middle than in that species. Anterior femora eight times as long as thick (48:6). Venter strongly widened beyond the middle. Length, 4.4 mm.; width, .88 mm. (at abdomen, 1.04 mm.).

Holotype, female, David, Chiriqui, Panama, Champion, in collection of British Museum of Natural History. This specimen is a cotype of Dr. Champion's C. rufonotatus, that

author having included two species in his original description. C. championi n. sp. is at once separated from the true rufonotatus by the absence of the spine-like setae on the gula. In this respect it agrees with C. uhleri n. sp. from which it may be separated by the different color markings which are somewhat darker, and especially by the differently formed pronotum. In uhleri the disc of the pronotum is almost level; in championi the anterior lobe is arched, and the posterior lobe is raised much above the anterior. Also in the former is the pronotum clothed with scattered upright hairs while in the latter it is thickly clothed with recumbent pubescence. The anterior acetabula open not so obliquely forward as in uhleri.

Carthasis gracilis Harris.

1925. Carthasis gracilis Harris, Bul. Brookl. Ent. Soc., XX, p. 172.

Elongate; flavo-testaceous, the head, a median stripe on pronotum (widened on posterior lobe), inner margin of clavus, and a prominent patch at inner apical angle of corium and another at apex, crimson. Scutellum reddish. Head longer than broad, the anteocular part thickly pubescent; provided beneath with four slender seta-like spines. Eyes prominent, slightly smaller than in other known species of the genus. Antennae pale, somewhat darkened distally, segment I distinctly longer than width of head thru eyes (23:14); proportion of segments, 23:26:25:37. Rostrum with

segment II shorter than III and IV conjoined (11:13).

Pronotum smooth, shiny, slightly longer (median measurement) than broad, the anterior lobe one-half longer than posterior and about equally as high. Scutellum with only a few fine hairs. Hemelytra shiny, only the costal margin along its basal half with hairs. Membrane fuscous, a large spot on either side at apex of corium lighter. Anterior femora more than 5 times as long as thick (34:4). Venter pale stramineous, pubescent, and also with a few scatterd longer hairs. Clasper as in figure (Plate III, fig.14). Length, 3.3-3.8 mm.; width, .55 - .6 mm (at abdomen, .58-.68 mm.).

This form, the slenderest of our known species of the genus, was originally described from two male specimens from Cuba. In addition to these there are two females, from Bolondron, P. de Guanahacabibes, Cuba (allotype), and Rio Piedras, Porto Rico respectively, before me. The markings are slightly variable, the head and scutellum sometimes being much darker than at others. In the Porto Rico specimen the pronotal stripe is almost obsolete and the spots of the hemelytra are not connected while in two of the Cuban specimens the pronotal stripe is quite dark and there is a crimson line along the outer margin of corium extending from apex of clavus to apex of corium, thus serving to connect the crimson patches.

Carthasis distinctus Harris.

1925. Carthasis distinctus Harris, Bul. Brookl. Ent. Soc., XX, p. 173.

Form broader than in C. gracilis; the color markings about as there except for pronotum, this with a broad reddish stripe on either side of a pale median one, the stripes strongly divaricating posteriorly onto humeri. Head longer than broad, armed beneath as in gracilis, the spines shorter. Eyes slightly larger than in gracilis, the length of one greater than width of vertex. Antennae only moderately long, segment I about equally as long as head, only about one-third longer than width of head thru eyes (19:15); the proportion of segments, 19:23:19:30. Rostrum with segment II distinctly shorter than III and IV conjoined (9:14).

Pronotum equally as broad as long, the anterior lobe about one-half longer than posterior and almost equally as high. Scutellum and hemelytra colored as in gracilis, but darker. Anterior femora only five times as long as thick (35:7), each with an obsolete darker spot above before the apex. Anterior tibiae slightly curved inwards. Abdomen above with a subapical crimson patch. Clasper hook-like (Plate III, fig. 9). Length, 3.5-4 mm.; width, .66-.82 mm. (at abdomen, .70-.83 mm.).

This distinct species was originally described from Cuba and is known only from the type localities. It is readily recognized by its broader form, shorter antennae, more incrassate anterior femora, and especially by the hook-like clasper of the male.

Carthasis minor Reuter.

1908. Carthasis minor Reuter, Mém. Soc. Ent. Belg., XV, p. 97.

1925. Carthasis minor Harris, Bul. Brookl. Ent. Soc., XX, p. 174.

Moderately elongate, pubescent; testaceous to flavo-testaceous, the head above, pronotum except for discal patch, scutellum, and clavus more or less rufous; a transverse fascia on hemelytra before the middle of the corium light fuscous to testaceous; a spot at middle of corium and a large patch at apex of corium (these connected by an interrupted line along apical margin) crimson. Head paler in front, thickly pubescent, longer than broad; beneath pale, with four short seta-like spines. Eyes red, large, coarsely granular. Antennae flavo-testaceous, the apical segments darkened, segment I subequal to the head in length, slightly longer than width of head thru eyes (20:17); proportion of segments, 20:19:18:30. Rostrum with segment II one-third shorter than III and IV conjoined.

Pronotum longer than broad, strongly constricted behind the middle; anterior lobe strongly arched, one-half longer than posterior; posterior lobe abruptly and strongly raised above the anterior (Plate III, fig. 13). Hemelytra strongly constricted before the middle, with a few upright hairs on clavus and corium, the latter also thinly pubescent. Membrane fuscous, a large patch on each side of apex of corium and the outer margin paler. Legs flavo-testaceous,

the anterior femora with a reddish band just beyond the middle. Mesosternum darkened. Venter light testaceous, thinly pubescent, also with a few long hairs. Genital segments crimson above, the claspers similiar in outline to C. decoratus (Plate III, fig. 8). Length, 3.48 mm.; width, .6 mm.

This species is, as I have previously pointed out, not to be confused with other members of the genus. It is easily recognized by the form of the pronotum, the anterior lobe being arched and the posterior lobe strongly and suddenly raised. The anterior lobe of the pronotum is rufous with its disc and the acetabula seen from above pale; the posterior lobe light testaceous. The anterior femora are much thicker than in C. decoratus Uhler, resembling C. distinctus in this respect, and each is marked slightly beyond its middle with a reddish band. The species is known only from Jamaica, West Indies.

Carthasis decoratus (Uhler).

1901. Orthometrops decoratus Uhler, Proc. Ent. Soc. Wash., IV, p. 509.

1908. Carthasis contrarius Reuter, Mém. Soc. Ent. Belg., XV, p. 97.

1916. Carthasis decoratus Barber, Jour. N. Y. Ent. Soc., XXIV, p. 308.

Elongate, shiny; pale stramineous to flavo-testaceous, the head in greater part, a broad median stripe on pronotum (widened on posterior lobe), scutellum, and clavus testaceous to rufous (sometimes more or less crimson);a prominent spot at inner apical angle of corium, a larger

one at outer apical angle, and sometimes an interrupted line along outer margin (connecting the two spots) crimson. Head slightly longer than broad, thinly pubescent; armed beneath with four seta-like spines. Eyes prominent, the length of one slightly greater (female) or equal to (male) width of vertex. Antennae slender, finely, thickly pubescent, flavo-testaceous, the apical segments darkened; segment I often with a reddish tinge, about twice as long as width of head thru eyes (33:17); the proportion of segments, 33:38:30:48. Rostrum with segment II shorter than III and IV conjoined.

Pronotum about as broad as long, clothed with a few fine hairs; the anterior lobe finely rugulose, about one-half longer (median measurement) than posterior; posterior lobe smooth, distinctly raised above the anterior. Scutellum with a few long erect hairs. Hemelytra shiny, finely rugulosely punctulate, with a few long hairs on clavus and along costal margin before the constriction; membrane smoky, a large spot opposite apex of clavus (extending around margin to apex) pale. Legs pale, clothed as in other species; the anterior femora about $7\frac{1}{2}$ times as long as thick (45:6). Venter finely pubescent, also with a few scattered long hairs. Clasper as in figure (Plate III, fig. 12). Length, 3.82-4.56 mm.; width, .7-.8 mm. (at abdomen, .74-.97 mm.).

Carthasis decoratus was originally described from Bladensburg, Maryland, and from Pennsylvania and New Jersey. It is now known to range thruout the eastern states. The darker markings of the head and pronotum vary from testaceous to rufous. Specimens have been examined from the following localities, Bogalusa, Louisiana, June 15, H. H. Knight; in Mississippi from Durant, Columbus, Weir, Port Gibson, and Crowder, July to Sept., C. J. Drake and H. M. Harris; Glen Echo, and Bladensburg, Maryland; White Plains, New York, Aug. 4, J. R. de la Torre-Bueno; and Black Mountain, North Carolina, Sept. 9, S. C. Bruner. The specimen from Bladensburg, Maryland, belonging to the H. E. Summer's collection, bears the exact collection data as did Reuter's type of C. contrarius. The Mississippi specimens were taken by beating low trees and bushes.

Carthasis rufonotatus Champion.

1900. Carthasis rufonotatus Champion, Biol. Centr. Am., Rhyn., II, p. 306, Tab. XIX, figs. 4, 4a (in part).

1925. Carthasis rufonotatus Harris, Bul. Brookl. Ent. Soc., XX, p. 174.

As is pointed out above (vide C. championi, n. sp.) Champion's description of this species is a composite one, that author having had two species before him. Unfortunately no specimens of rufonotatus are at hand. However, Mr. W. E. China of the British Museum has kindly compared specimens of C. decoratus Uhler with the types of rufonotatus and

writes in part as follows:-

"Champion has evidently confused two species under his Carthasis rufonotatus and his description appears to be a composite one. His figures whilst being structually accurate for one species, are not correctly colored. All his specimens are females. Of the five specimens mentioned by him from Panama, only four remain, the one from Bugaba having been apparently lost. The type specimens (two on one card), from which the drawing but not the coloring of his figure was made, are from Caldera and agree with a female from Tole in having four bristle-like spines on the gula. Indeed this species is closely related to C. decoratus Uhler and agrees quite well with Reuter's description of C. contrarius. It differs however from your specimen of C. decoratus in having the second antennal segment equal to instead of longer than the first; the red pigment on the head, scutellum and inner margin of clavus, (present in your specimen) is also more or less obsolete although the red spots on the inner and outer apical angles of the corium, the coloring of the membrane and the broad median vitta on the anterior pronotal lobe are the same; the pleura are concolorous pale stramineous".

From this then it is evident that C. rufonotatus is very close and possibly synonymous with C. decoratus Uhler. However, in all of the specimens of the latter that I have examined, the second antennal segment is dis-

tinctly longer than the first.

Genus NEOGORPIS Barber.

1924. Neogorpis Barber, Jour. N. Y. Ent. Soc., XXXII, p. 136.

"The body is more slender than in Gorpis. The head is elongate, cylindrical and porrect, subequally long as the anterior lobe of the pronotum; anteocular part of head much longer than the postocular, the latter more swollen; ocelli absent. Rostrum shorter than in Gorpis reaching only to apex of prosternum, second segment about one-third longer than third. Antennae long and slender, inserted midway between apex of head and eyes, first segment nearly as long as head and anterior lobe of pronotum together and about two-thirds as long as second segment, the last two segments capillaceous, with the first of these much longer than the ultimate. Pronotum dull, not pilose, much longer than wide; collar very wide, not sharply delimited; anterior lobe a little longer and little narrower than the posterior lobe, impunctate; humeral angles unarmed. Scutellum swollen, elongate, impunctate, almost twice as long as wide, apex not laterally contracted, slightly obtuse. Hemielytra very elongate, a little longer than the abdomen, impunctate, very convex, parallel sided; commissure about four times as long as scutellum; membrane not plainly demarked from the corium, the latter provided with two veins the inner one forked opposite to apex of commissure; veins of the membrane very faint. Propleurae as seen dorsally much di-

lated; anterior acetabulae excised before middle of prosternum, closed behind; anterior coxae elongate; legs elongate with the anterior femora somewhat incrassate, densely setose beneath and provided with a few small teeth; anterior tibiae slightly shorter than the femora, very slightly curved and provided inwardly thru entire length with small acute oblique spines; apex of posterior femora not incrassate nor nearly reaching to apex of hemielytra.

Genotype: Neogorpis neotropicalis Barber."

Only one species is known.

Neogorpis neotropicalis (Barber).

1923. Gorpis neotropicalis Barber, Amer. Mus. Novitates, No. 75, p. 8.

1924. Neogorpis neotropicalis Barber, Jour. N. Y. Ent. Soc., XXXII, p. 136.

"Sordid yellow-white; antennae, dorsum of head in part, scutellum posteriorly, streak on clavus posteriorly and also along inner and apical margin of corium, rostrum, apices of all femora, base and apex of all tibiae, dilute red.

"Head smooth, shining, plainly pilose below and with a few scattered long hairs above; space between the eyes subequal to that of diameter of eye itself; ocelli not discernible, sides of tylus longitudinal streak on the vertex and a V-shaped fascia runing back from the center of the eyes to base, dilute red. Antennae finely pilose,

irrorate with red on the two basal segments, basal segment about as long as head and the anterior lobe of the pronotum taken together, apex slightly incrassate, two-thirds as long as second; third segment one-third shorter than first; fourth segment over one-half, nearly two-thirds as long as third segment. Rostrum finely pilose, with short, thick basal segment, second segment one-third longer than third, fourth less than one-half the length of third. Pronotum dull, non-pilose, obtusely constricted behind middle, with the anterior lobe exclusive of collar a trifle longer than posterior lobe; disk of both lobes impunctate, with a few coarse punctures along the sides posterior to the transverse stricture; anterior lobe with a faint median sulcus; humeral angles unarmed, provided with an elongated rounded prominence; posterior margin evenly arcuated, not straight before the base of scutellum. Scutellum impunctate, slender, transversely depressed before the middle; disk behind this somewhat swollen, dilute red; apex depressed, very acute. Hemielytra dull, obsoletely wrinkled; clavus posteriorly dilute reddish; corium with costal margin from close to base narrowly expanded; inwardly streaked with dilute red close to and along apical half of clavus extending to beyond base of membrane, another similar streak along the inner margin of corium next to the membrane which does not quite reach the apex of corium; apex of corium reaching back as far

as apex of abdomen. Membrane pale, reaching well beyond apex of abdomen. Wings reaching apex of abdomen. Legs long and slender with long pile; fore femora slightly incrassate, almost straight, provided above with a few scattered long hairs and below densely clothed with numerous spinules interspered with slender bristles and hairs; fore tibiae curved at base, gently curved apically from middle, inwardly serrate, serrations tipped with downwardly curved setae; towards apex rather abruptly expanded and armed inwardly with a stout, curved spine or process extending beyond apex of tibia. Propleuron coarsely punctate; mesopleuron smooth, broadly whitish pruinose except along outer margin. Venter smooth, shining; genital segment of male finely pilose, provided on either side with an upwardly directed, curved and somewhat twisted acute genital hook, curving toward median line. Length, 12 mm."

Known only from the types from Porto Rico in the collection of the American Museum of Natural History.

LITERATURE CITED.

(References marked with an asterisk have not been verified in the original).

Banks, Nathan

1910. Catalogue of the nearctic Hemiptera-Heteroptera. Philadelphia. pp. 1-103 + i-viii.

Barber, H. G.

1906. Hemiptera from southwestern Texas. Mus. Brooklyn Inst., Sci. Bull., I:255-289.

1914. Insects of Florida. II. Hemiptera. Bull. Am. Mus. Nat. Hist., 33:495-535.

1916. (A Review of the Nabidae of the United States). Jour. N. Y. Ent. Soc., 24:308.

1922. Two new species of Reduviidae from the United States (Hem.). Proc. Ent. Soc. Wash., 24:103-104.

1923. A Preliminary report on the Hemiptera-Heteroptera of Porto Rico collected by the American Museum of Natural History. Amer. Mus. Novitates, No. 75:1-13.

1924. Corrections and Comments, Hemiptera-Heteroptera. Jour. N. Y. Ent. Soc., 32:133-137.

Bergroth, E.

1916. New and little-known Heteropterous Hemiptera in the United States National Museum. Proc. U. S. Nat. Mus., 51:215-239.

Blatchley, W. S.

1926. Heteroptera or true bugs of Eastern North America. Indianapolis. pp. 1-1116, numerous text figs., 12 pls.

Bruner, L. and Swenk, H. H.

1907. Some insects injurious to wheat during 1905-1906. Neb. Agr. Exp. Sta. Bull. 96:1-36.

Butler, Edward A.

1923. A Biology of the British Hemiptera -Heteroptera. Lond. pp. i-viii + 1-682, pls. I-VII.

Champion, G. C.

1897-1901 Insect, Rhynchota. Hemiptera Heteroptera, II; i-xvi + 1-416, 22 pls. In Biologia Centrali-Americana. Lond. 1880-1909.

Costa, Achille.

*1852. Cimicum regni Neapolitani centuriae. Napoli 1838-1852. Cent. 3 et 4 (not completed) 1852, 73 pp., 3 pls.

Distant, W. L.

1903-1904 The Fauna of British India, including Ceylon and Burma. Rhynchota, II: xvii+242, 1903; 243-503, 1904, 319 figs.

Douglas, John William and Scott, John.

1865. The British Hemiptera. I. Hemiptera-Heteroptera. London. pp. i-xii+1-627, 21 pls.

Fabricius, Johann Christian.

1775. Systema entomologiae sistens insectorum, synonymis, etc. Flensburgi et Lipsiae. pp. 1-832.

1794. Entomologia systematica emendata et aucta, secondum classes, etc. Tome IV. Hafniae. pp. i-vi + 1-572+(index) 5 pp.

Fieber, Franz Xavier.

1860-1861 Die europaischen Hemiptera. Halbfluger (Rhynchota Heteroptera). Nach der analytischen Methode bearbeitet. Wien. pp. i-vi + 1-112, 1860; 113-114, 1861. 2 pls.

Flint, W. P.

1918. Insect enemies of the chinch bug. Jour. Ec. Ent., 11:415-419.

Frost, S. W.

1918. Two species of Pegomyia mining the leaves of dock. Jour. Agr. Res., 16:229-243, pls. 28-30.

Garman, H. and Jewett, H. H.

1914. The life history and habits of the corn-ear worm. (Chloridea obsoleta). Ky. Agr. Exp. Sta., Bull. 187:511-591, 16 figs.

Germar, Ernst Friedrich.

*1837. Hemiptera Heteroptera promontorii Bonae Spei nondum descripta, quae collegit C. F. Drege. Silb. Rev. Ent., 5:121-192.

Harris, Halbert M.

1925a. A new species of Nabidae (Costa) from the western United States (Hemiptera). Ent. News, 36:205-206.

1925b. Two new species of Carthasis (Hemiptera, Nabidae). Bull. Brooklyn Ent. Soc., 20:172-174.

1926a. Distributional notes on some neotropical bugs of the family Nabidae, with description of a new species. Proc. U. S. Natl. Mus., 69, art. 21:1-4.

1926b. Notes on some American Nabidae (Hemiptera). Ent News, 37:287.

1928. Anent Blatchley's Manual of Heteroptera, with description of a new nabid therefrom. Bull. Brooklyn Ent. Soc. (in press).

Hawley, I. Myron.

1917. The hop redbug (Paracalocoris hawleyi Knight). Jour. Econ. Ent., 10:545-552, figs. 28-35, pl. 28.

Hickman, Dorothy J.

1921. Illustrations of the male hooks in Nabis (Nabidae, Hemiptera). Bull. Brooklyn Ent. Soc., 16:58-59, figs. 1-12.

Howard, L. O.

1900. The insects to which the name kissing bug became applied during the summer of 1899. U. S. Dept. Agr., Div. Ent., Bull. 22 (N.S.); 24-30, figs. 18-24.

Kirby, William.

1837. The insects in Richardson's Fauna Boreali-Americana, 4, pp. i-xxxix + 1-318 + index. 8 pls. London.

Kirkaldy, G. W.

1900. Bibliographical and nomenclatorial notes on the Rhynchota. No. I. Entom., 33:238-243.

1901. Anmerkungen über bemerkenswerte Nabinen (Rhynchota). Wiener Ent. Zeit., 20:219-225.

Latreille, Pierre André.

*1802. Histoire naturelle, générale et particulière des Crustacés et des Insectes. Paris. 14 Vols., 1802-1805. Vol. 3:xii + 467, 1802.

1807. Genera crustaceorum et insectorum secundum, etc. 4 vols., 1806-1807. Vol. 3:1-258, 1807.

Lethierry, L. et Severin, G.

1896. Catalogue general des Hémiptères. Bruxelles and Berlin. 3 vols., 1893-1896. Vol. 3, 1896, pp. 1-275.

Linnaeus, Carl.

1758. Systema naturae per regna tria naturae secundum classes, etc. Holmiae, Tome I; pp. 1-824. Englemann facsimile reprint, 1894, Leipsic.

*1761. Fauna Suecica sistens animalia sueciae regni, aves, etc. Stockholmiae, pp. 1-46 + 1-578, 2 tab.

Meyer-Dur, L. R.

1870. Entomologische Parallelen zwischen den Faunen von Central-Europa und der süd-amerikanischen Provinz Buenos-Ayres. Mittheil. schw. ent. Ges., 3:175-178.

Meyers, J. G.

1925. Biological notes on Arachnocoris albomaculatus Scott (Hemiptera; Nabidae). Jour. N. Y. Ent. Soc., 33:136-146, pl. VI.

Mundinger, F. G.

1922. The life history of two species of Nabidae (Hemip. Heterop.). N. Y. St. Coll. For., Tech. Pub. No. 16: 149-167, pls. XII-XIX.

Osborn, Herbert.

1912. Leafhoppers affecting cereals, grasses and forage crops. U. S. Dept. Agr., Div. Ent., Bull. 108: 3-123, figs. 1-29.

1918. The meadow plant bug, Miris dolobratus. Jour. Agr. Res., 15:175-200, figs. 1-5, pl. XII.

Oshanin, B.

1908. Verzeichnis der palaearctischen Hemipteren mit besonderer Berücksichtigung ihrer Verteilung im russichen Reiche. 3 vols. St. Petersburg, 1906-1910. Band I, part 2: 394-586, 1908.

1912. Katalog der paläarktischen Hemipteren (Heteroptera, Homoptera-Auchenorhyncha und Psylloideae.).Berlin. pp. i-xvi+ 1-187.

Parshley, Howard Madison.

1920. Hemiptera from Peak's Island, Maine, collected by Mr. G. A. Moore. Can. Ent., 52:80-87.

1922. Report on a collection of Hemiptera-Heteroptera from South Dakota. So. Dak. St. Coll., Tech. Bull. 2:1-22, 2 figs.

1923. Family Nabidae. In Britton, Guide to the insects of Connecticut. Part IV. The Hemiptera or sucking insects of Connecticut. Hartford, 1923, pp. 1-807, pls. I-XX.

Provancher, Léon.

*1869. Description d'un nouvel Hémiptère. Nat. Can., I:211-212.

Reuter, O. M.

1872a. Skandinaviens och Finlands Nabider. Öfv. Svenska Vet.-Ak.Förh., 29, No. 6:67-77.

1872b. Nabidae novae et minus cognitae. Bidrag till Nabidernas kannedom. Öfv. Svenska Vet. Ak. Förh., XXIX, No. 6:79-96. Tab. VIII.

1890. Ad cognitionem Nabidarum. Rev. d'Ent., 9:289-309, figs. 1-5.

1893. Die äthiopischen Arten der Nabiden-Gattung Phorticus. Wiener Ent. Zeit., 12:316-320.

1908. Bemerkungen über Nabiden nebst Beschreibung neuer Arten. Mém. Soc. Ent. Belgique, 15:87-130.

1909. Die Arten der Nabiden Gattung Gorpis Stål. Ann. Soc. Ent. Belgique, 53:423-430.

1912a. Bemerkungen über mein neues Heteropterensystem. Öfv. Finska Vet.-Soc. Förh., 54, (A), No. 6:1-62.

1912b. Hemipterologische miscellen. Öfv. Finska Vet.-Soc. Förh., 54 (A), No. 7:1-76.

1913. Ausfürliche Beschreibungen einiger paläarktischen Hemipteren. Öfv. Finska Vet.-Soc.Förh., 55, (A), No. 14:1-111, 1 pl.

Reuter, O. M. et Poppius, B.

1909. Monographia Nabidarum orbis terrestris. Acta Soc. Sci. Fennicae, 37, No. 2:1-62, 1 pl.

Saunders, Edward.

1892. The Hemiptera-Heteroptera of the British Islands. A descriptive account of the families, etc. London. pp. i-vi +1-350, pls. I-XXXII.

Spinola, Maximilien.

1837. Essai sur les genres d'insectes appartenants a l'ordre, des Hémiptères, etc. Genes, pp. 1-383.

Stål, Carl.

1855. Hemiptera från Kafferlandet. Öfv. Svenska Vet.-Ak. Förh., 12:27-47.

Stål, Carl (continued).

1860-1862. Bidrag till Rio Janeiro-traktens Hemiptera-fauna. Kongl. Svenska Vet.-Ak. Handl., II, No. 7:pp. 1-84, 1860; III, No. 6:1-75, 1862.

1862. Hemiptera Mexicana enumeravit speciesque novas descriptsit. Stett. Ent. Zeit., 23:81-118, 273-281, 289-325, 437-462.

1865. Hemiptera Africana. 4 vols. Holmiae, 1864-1866. Vol. 3, 1865, pp. 1-200.

1873. Enumeratio Hemipterorum. 5 parts, in Kongl. Svenska Vet.-Akad.Handl. 1870-1876. Part III, in Vol. II, No. 2:1-167, 1873.

Stein, J. P. E. Fdr.

1857. Die Gattung Prostemma Laporte. Berliner Ent. Zeit., I:81-96.

Summers, H. E.

1891. The true bugs, or Heteroptera, of Tennessee. Tenn. Agr. Exp. Sta., Bull. 4:75-96, 14 figs.

Torre-Bueno, J. R. de la

1912. Records of Heteroptera from Brownsville, Texas (Hemip.). Ent. News, 23:120-122.

1920. Notes on the Heidemann collection of Heteroptera now at Cornell University. Bull. Brooklyn Ent. Soc., 15:70.

Uhler, Philip Reese.

1876. List of Hemiptera of the region west of the Mississippi River, including those collected during the Hayden explorations of 1873. Bull. U. S. Geol. Geog. Surv. Terr., I:269-361, pls. 19-21.

1901. Some new genera and species of North America Hemiptera. Proc. Ent. Soc. Wash., 4:507-515.

1904. List of Hemiptera-Heteroptera of Las Vegas, Hot Springs, New Mexico, collected by Messrs. E. A. Schwarz and Herbert S. Barber. Proc. U. S. Natl. Mus., 27:349-364.

Van Duzee, Edward P.

1917. Catalogue of the Hemiptera of American north of Mexico, excepting the Aphididae, Coccidae and Aleurodidae. Univ. Calif. Pubs. Ent., 2:i-xiv+ 1-902.

Westwood, J. O.

1839-1840 An introduction to the modern classification of insects, etc. 2 vols. London. Vol. 2, i-xi+ 1-587 + (Generic Synopsis) 1-158.

White, F. Buchanan.

1878-1879 List of the Hemiptera of New Zealand. Ent. Mo. Mag. 14: 274-277; 15:31-34, 73-76, 130-133, 159-161, 213-220.

Woods, William Colcord.

1915. Blueberry insects in Maine. Maine Agr. Exp. Sta., Bull. 244:249-288, figs. 56-62.

PLATE I.

Fig. 1. Nabis subcoleoptratus (Kirby), male clasper.

Fig. 2. N. heidemanni (Reut.), male clasper.

Fig. 3. N. sordidus Reut., male clasper.

Fig. 4. N. dentipes n. n., male clasper.

Fig. 5. N. deceptivus n. sp., male clasper.

Fig. 6. N. nigriventris Stål., male clasper.

Fig. 7. N. spinicrus Reut., male clasper.

Fig. 8. N. annulatus Reut., male clasper.

Fig. 9. N. constrictus Champ., male clasper.

Fig. 10. N. gerhardi Harris, male clasper.

Fig. 11. N. panamensis Harris, male clasper.

Fig. 12. N. lovetti Harris, male clasper.

PLATE I

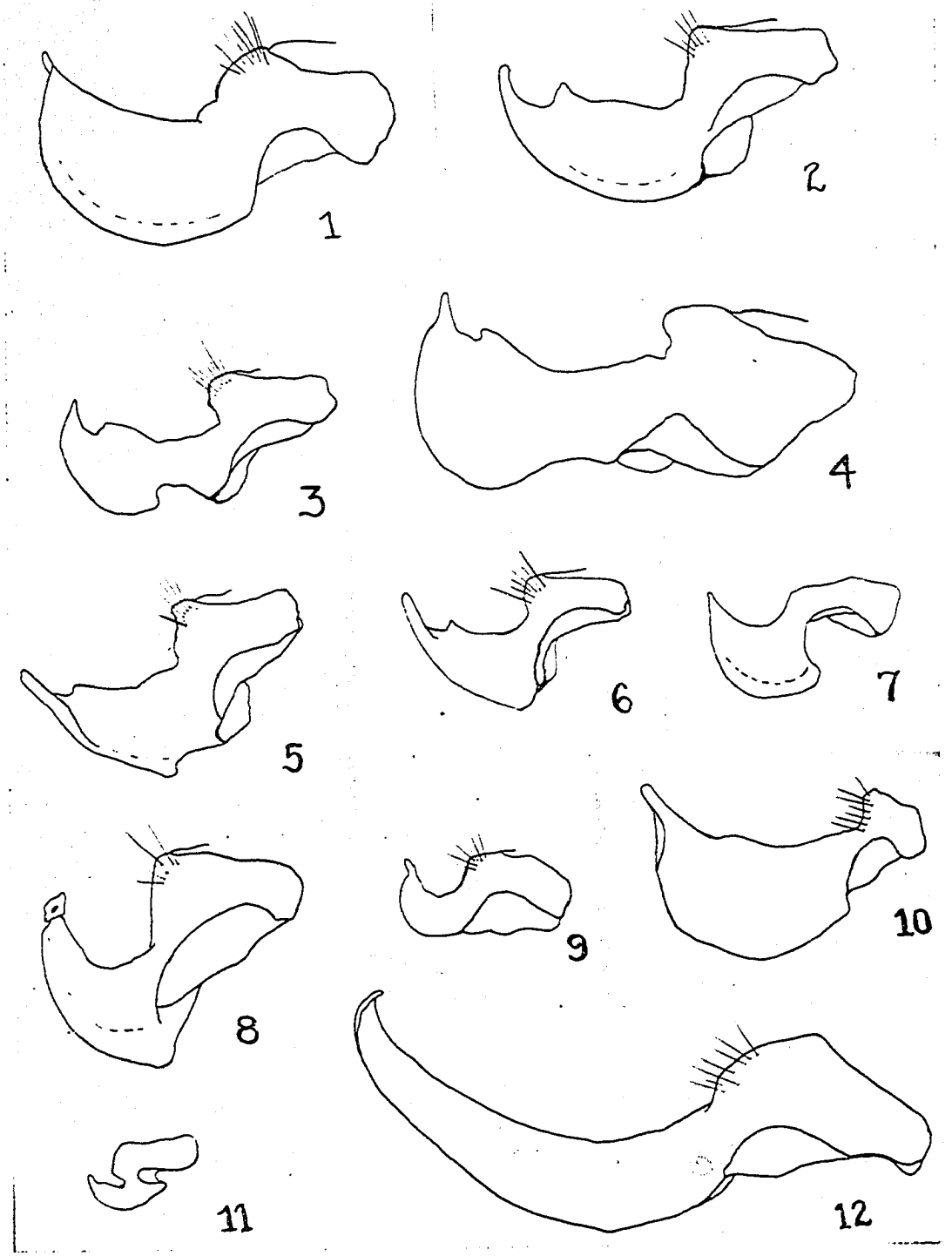

PLATE II.

Fig. 1. Nabis propinquus Reut., male clasper.

Fig. 2. N. flavomarginatus Scholtz, male clasper.

Fig. 3. N. nigrovattatus Sahlb., male clasper.

Fig. 4. N. capsiformis Germar, male clasper.

Fig. 5. N. limbatus Dahlb., male clasper.

Fig. 6. N. roseipennis Reut., male clasper.

Fig. 7. N. vanduzeei (Kirk.), male clasper.

Fig. 8. N. rufusculus Reut., male clasper.

Fig. 9. N. kalmii Reut., male clasper.

Fig. 10. N. inscriptus (Kirby), male clasper.

Fig. 11. N. alternatus Parshley, male clasper.

Fig. 12. N. ferus (Linn.), male clasper.

PLATE II

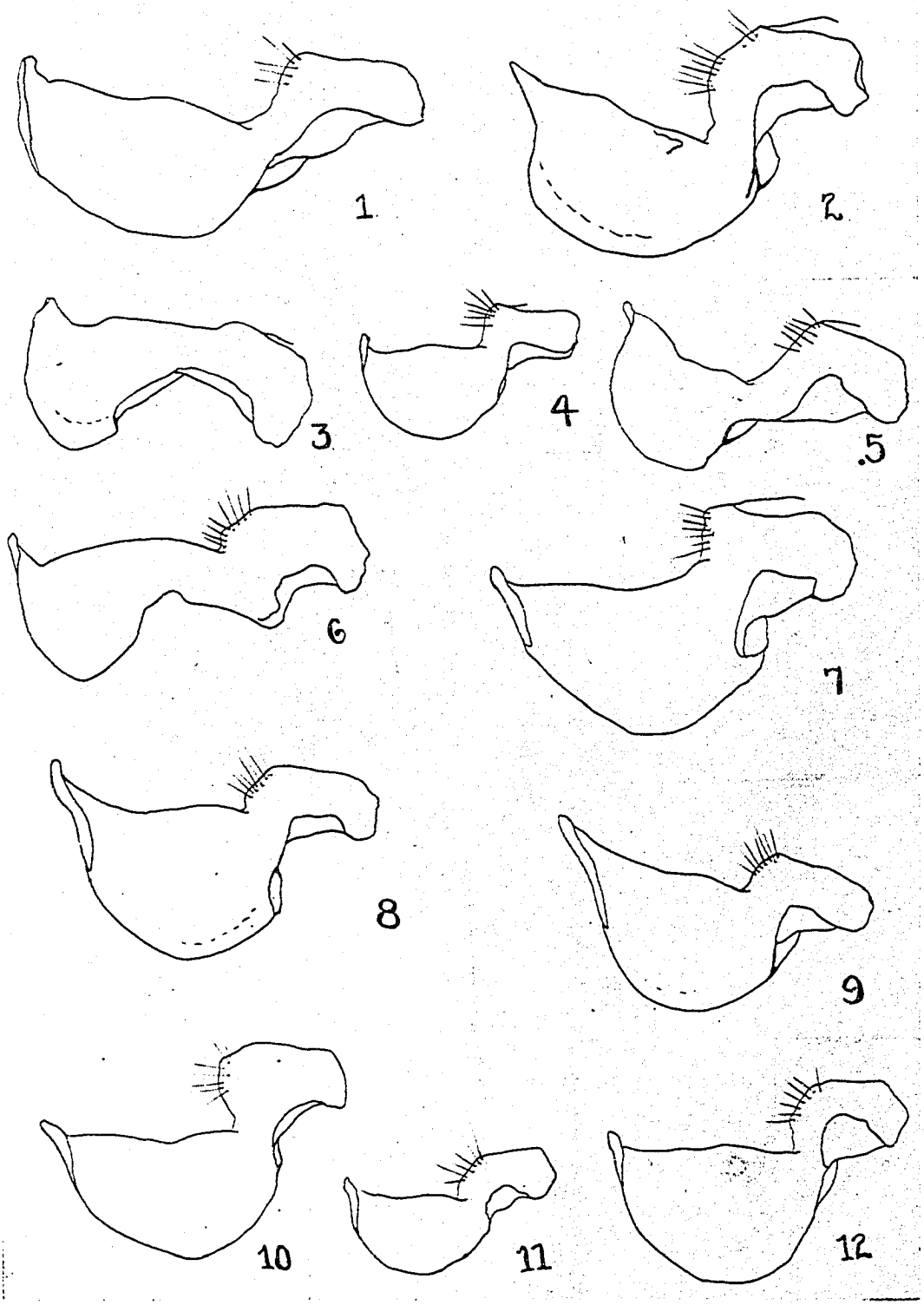

PLATE III.

Fig. 1. Pagasa pallipes Stål, male clasper.

Fig. 2. P. luteiceps (Walker), male clasper.

Fig. 3. P. fusca (Stein), male clasper.

Fig. 4. Arachnocoris albomaculatus Scott, male clasper.

Fig. 5. Metatropiphorus drakei n. sp., male clasper.

Fig. 6. M. belfragii Reut., male clasper.

Fig. 7. Arachnocoris trinitatis Bergroth, male clasper.

Fig. 8. Carthasis minor Reut., male clasper.

Fig. 9. C. distinctus Harris, male clasper.

Fig. 10. Alloeorrhynchus trimacula (Stein), male clasper.

Fig. 11. Carthasis uhleri n. sp., male clasper.

Fig. 12. C. decoratus (Uhl.), male clasper.

Fig. 13. C. minor Reut., head and thorax.

Fig. 14. C. gracilis Harris, male clasper.

PLATE III